

# AUTOMOTIVE INDUSTRIES

## THE AUTOMOBILE

Reg. U. S. Pat. Off.  
Published Weekly

Volume 80

Number 6

JULIAN CHASE, Directing Editor  
HERBERT HOSKING, Editor  
P. M. HELDT, Engineering Editor J. B. POLLOCK, Ass't Editor  
JOS. GESCHELIN, Detroit Technical Editor MARCUS AINSWORTH, Statistician  
J. A. LAANSMA, Detroit News Editor HOWARD KOHLERENNER, Art Editor  
JEROME H. FARRIS, Ass't Editor L. W. MOFFETT, Washington Editor  
H. E. BLANK, JR., Ass't Editor JAMES G. ELLIS, Washington Editor  
B. M. IKERT, Contributing Editor

### CONTENTS

News of the Industry	143
Just Among Ourselves	155
What Must Be Done About National Defense—Now?	156
Production Lines	165
Moments of Inertia of Annular Bodies. By William Samuels	166
Early History of the Pneumatic Tire	169

### Features in the News

Summary of Production Activity	Publications Available
Ourselves and Government	Men of the Industry
Advertising News Notes	Chart of Production Activity
Business in Brief	Calendar of Coming Events
Automotive Metal Markets 40 Years Ago	
Advertisers' Index	39

Copyright 1939 by Chilton Company (Inc.)

C. A. MUSSELMAN, Pres.; J. S. HILDRETH, Vice-Pres. and Manager, Automotive Division; G. C. BUZBY, Vice-Pres.

### OFFICES

Philadelphia—Chestnut & 56th Sts., Phone Sherwood 1424  
New York—239 W. 39th St., Phone Pennsylvania 6-1100. Chicago—Room 916, London Guarantee & Accident Bldg., Phone Franklin 4243. Detroit—1015 Stephenson Bldg., Phone Madison 2090. Cleveland—609 Guardian Bldg., Phone Cherry 4188. Washington—1061 National Press Bldg., Phone District 6877. San Francisco—444 Market St., Room 305, Phone Garfield 6788. Long Beach, Cal.—1595 Pacific Ave., Phone Long Beach 613-238.  
Cable Address ..... Autoland, Philadelphia

**SUBSCRIPTION RATES:** United States, United States Possessions, and all Latin-American countries, \$1.00 per year; Canada and Foreign, \$2.00 per year. Single Copies this issue, 25c.

Member of the Audit Bureau of Circulations  
Member Associated Business Papers, Inc.

Entered as second-class matter Oct. 1, 1925, at the post office at Philadelphia, Pa., under the Act of March 3, 1879.  
Automotive Industries—The Automobile is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903, the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

Owned and Published by



**CHILTON COMPANY**  
(Incorporated)

**Executive Offices**  
Chestnut and 56th Streets, Philadelphia, Pa., U. S. A.

**Officers and Directors**  
C. A. MUSSELMAN, President  
FRITZ J. FRANK, Executive Vice-President

FREDERIC C. STEVENS, JOSEPH S. HILDRETH, GEORGE H. GRIF-FITHS, EVERET B. TERHUNE, Vice-Presidents; WILLIAM A. BARBER, Treasurer; JOHN BLAIR MOFFETT, Secretary; JOHN H. VAN DE-VENTER, JULIAN CHASE, THOMAS L. KANE, CHARLES S. BAUR, G. CARROLL BUZBY, P. M. FAHRENDORF.

Automotive Industries

When writing to advertisers please mention Automotive Industries

February 11, 1939

**Hotel RADISSON**  
**\$200,000 IN NEW APPOINTMENTS**

Enjoy the greater comforts of a Greater Hotel Radisson! New furnishings—new decorations—air-conditioned bedrooms and sample rooms. Four delightful restaurants—choice foods and beverages. Popular orchestras for dinner and supper dancing in Chateau Terrace. Music in Lounge. Pier from 4 to 6. Rates from \$3.00

**IN DOWNTOWN MINNEAPOLIS**  
**R. A. HOOD, GEN. MGR.**

## WANTED

Persons interested in the production and sale of patented Low-Priced carburetors with surprising and proven gasoline savings for all automobile and airplane motors.

During the last 20 years few new developments have been applied to carburetors. Now, through modification and simplification, a working economy of 15% is achieved.

WRITE: "Epochal", A. O. Box 31, Gordon House, Farringdon Street, London, England.



FOR OVER  
**40** YEARS



**THE PIONEER  
MANUFACTURER OF**

**AUTOMATIC  
CHUCKING EQUIPMENT**

**POTTER & JOHNSTON MACHINE CO.**  
PAWTUCKET, R. I., U. S. A.



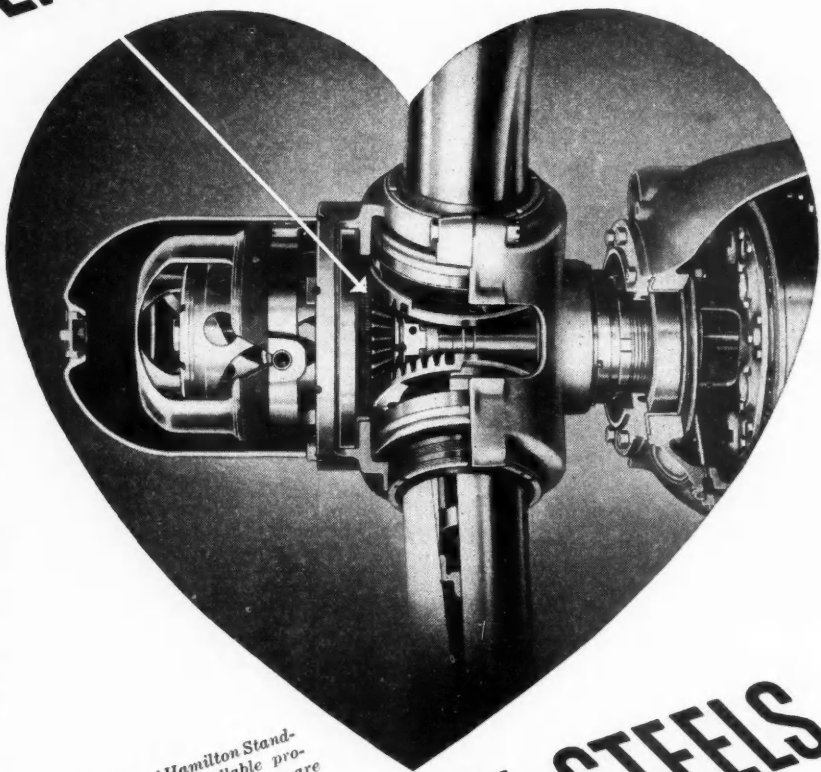
Flying on one engine, this United Mainliner has quickly switched the other prop to full-feathering position, eliminating drag. As quickly, this Hamilton Standard Hydromatic prop can be "shifted" to proper pitch for climbing or cruising. Hub mechanism is based on Nickel alloy steels.

## HEART OF "FEATHERING" HUB

Through long development, Hamilton Standard engineers have evolved a fool-proof mechanism—used in the hubs of this United Mainliner—to feather propellers quickly in flight.

"Shifting gears" imposes gruelling load and stress on the Hamilton Standard Hydromatic hub mechanism. So for the bevel gear segment and rotating cam, only SAE 2515 is used. This 5% Nickel steel is case-hardened for surface wear resistance. The spider is forged from SAE 4340, high-strength Nickel-chromium-molybdenum steel, quenched and tempered to a Brinell hardness of 371-415.

From trainer to clipper, every type ship relies upon Nickel. The constructional grades of Nickel alloy steel have long been widely employed for engine parts. Now in the ship itself there is a rapidly increasing use of the 18% chromium, 8% Nickel type stainless steels in the construction of wing, tail and fuselage. Properly processed, these alloys combine excellent corrosion and fire resistance with high mechanical properties.



Phantom view of Hamilton Standard Hydromatic controllable propeller hub. Highly stressed units are SAE 2515 and 4340, Nickel alloy steels.

## NICKEL ALLOY STEELS

**THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.**

February 11, 1939

When writing to advertisers please mention *Automotive Industries*

*Automotive Industries*

AUTOMOTIVE INDUSTRIES, Vol. 80, No. 6. Published weekly by Chilton Co., Chestnut & 56th Sts., Phila. Entered as Second-Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In Case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, \$1.00 per year. Canadian and Foreign, \$2.00 per year; single copies, 25 cents, except Statistical Issue (Feb. 25, 1939), 50 cents.



Acme

## Prepares for Approval

Having completed the first phase of flight testing of the new four-engine "Stratoliner," the Boeing Aircraft Co. has started installation of cabin supercharging, heating and air conditioning equipment in the plane for the next series of tests, which will be carried on at the higher altitudes for which the plane is designed. Installation of the substratosphere equipment is expected to be completed by the middle of this month. Official Civil Aeronautics Authority tests for license approval will be made concurrently with this next series of flight tests.

## GM Earnings At \$102,320,000

Alfred P. Sloan, Jr., chairman of General Motors Corp., announced on Tuesday preliminary net earnings of General Motors, subject to final audit, available for dividends for the year ended Dec. 31, 1938, amounted to \$102,320,000 which, after providing for preferred dividends, were equivalent to \$2.17 per share on the average common shares outstanding during the year, compared with earnings of \$4.38 per share for the year 1937.

## Blames NLRB for UAW Recognition Confusion

Responsibility for the confusion existing in the automobile industry as to which faction of the United Automobile Workers Union should be recognized as the collective bargaining agency was placed on the National Labor Relations Board on Monday by Representative Clare E. Hoffman, Republican of Michigan.

"Homer Martin claims that he is the man who represents the UAW. Thomas,

of a rival group, says that he and his associates are the ones with whom collective bargaining should be carried on," Hoffman said in a House speech.

"General Motors does not know with whom it can safely bargain and through it all the labor board, which two years ago could have made a complaint—called an election—designated the bargaining unit and determined the representatives for collective bargaining, sits, so far as solving the real problem is concerned, idly by."

Criticism of the NLRB was voiced in the House when a proposed appropriation of \$3,189,600 for the labor board was brought up for discussion. The CIO had wired many congressional members asking that the amount be increased to \$3,230,000.

## Motor Wheel Corp. Regular Dividend

The board of directors of Motor Wheel Corp., at a meeting held Feb. 4, declared the regular quarterly dividend of forty cents per share on the common stock payable Mar. 10 to stockholders of record Feb. 17.

## Week's Output Up 2000 Units

### Retail Deliveries Still Show Gains

By registering an increase over the preceding week, car and truck production for the week ending Feb. 11 continued to show strong resistance to seasonal influences and showed that the lead already held over the same period a year ago was being maintained.

A preliminary survey of factory schedules for the week indicated that production would total approximately 82,000 cars and trucks as compared with 80,000 a week ago. February production through the week ending Feb. 11 is estimated at close to 125,000 units and, with expectations that the current pace will be maintained during the balance of the month, February's total should be in the neighborhood of 330,000 units.

The increase during the current week can be credited to resumption of previous schedules by Dodge and Plymouth, both of whom lost a day during the previous week because heavy snows made transportation of finished vehicles from the plants impossible. All Chrysler divisions contributed more than 19,000 cars and trucks to the week's total as compared with slightly more than 16,000 a week ago. General Motors divisions, with an approximate total of 32,000 units, maintained their previous pace as did Ford with almost 22,000. Independent producers, led by Nash with more than 1500, and including Studebaker, Packard and Hudson, were closely bunched.

Retail deliveries for January, as indicated by sales reports received from factories continued to show significant gains over the same month a year ago, although seasonally lower than in December. Buick, with sales of 12,977 units enjoyed the highest January in its history and showed a gain of 37.5 per cent over the previous January. The company's highest previous January was in 1926, when 11,285 cars were sold. Pontiac's January retail deliveries were 10,360, an increase of 64.3 per cent over the previous year. New car inventories in dealers hands on Jan. 31 were 25.0 per cent below the same time a year ago.—J.A.L.



# Business Indexes Indicate General Leveling Tendency

*An Exclusive and Regular Weekly Feature  
Written by the Guarantee Trust Co., N. Y.*

The diversity of movements in various branches of business last week indicates a further general leveling tendency. The *Journal of Commerce* business index for the week before, ended Jan. 28, declined fractionally to 86.8, as against 87.0 in the third week of the month and 70.6 a year ago.

Retail business last week was hampered by weather conditions over broad areas. For the week ended Jan. 28 department store sales, according to the Board of Governors of the Federal Reserve System, were 1 per cent below the corresponding level last year.

The output of electricity by the light and power industry in the week ended Jan. 28 registered a further gain, contrary to the usual seasonal tendency, and was 9.2 per cent above the production in the fourth week of last year.

Railway freight loadings in the same week totaled 594,379 cars, or 4020 cars more than in the preceding week, exceeding by 7.4 per cent the corresponding 1938 loadings.

Average daily production of crude oil in the week ended Jan. 28 was 3,248,250 barrels, or 16,200 barrels less than the average for the preceding

week, as against 3,357,650 barrels a year ago. Daily requirements for January, as computed by the U. S. Department of the Interior, were 3,270,600 barrels.

The average daily production of bituminous coal in the same period was 1,433,000 tons, as compared with 1,362,000 tons in the preceding week and 1,270,000 tons a year ago.

Engineering construction contract awards in January, according to the weekly averages reported by *Engineering News-Record*, were the greatest for any month since May, 1930, exceeding by 64 per cent the average for January, 1938. Public construction recorded a gain of 136 per cent over that reported for the preceding January, while private construction was 35.5 per cent less.

Lumber production and distribution declined somewhat in the week ended Jan. 28. For the first four weeks of the year, as compared with the like period in 1938, production, shipments, and new orders showed gains of 32 per cent, 16 per cent, and 9 per cent, respectively.

The *New York Times* index of cot-

ton mill activity for the same week remained unchanged at 123.2 per cent of the estimated normal, as against 86.7 a year ago.

Professor Fisher's index of wholesale prices for the week ended Feb. 4 remained again unchanged at 79.8 per cent of the 1926 average.

Reserves of member banks of the Federal Reserve system declined \$119,252,000 in the week ended Feb. 1. Estimated excess reserves were reduced to \$3,480,000,000.

## GM-Cornell Index Moves Down to 60.8

The General Motors-Cornell World Price Index of 40 basic commodities for the week ended Jan. 28 was 60.8, compared with 60.9 for the previous week. The United States index in gold increased 0.2 to 63.4.

## New Type Car Seat Uses Leaf Springs

Radical innovation in seat design is promised by a new development which is to be introduced by the F. L. Jacobs Co., Detroit, Mich., prominent manufacturers of tubular seat frames. This company is working on a unique design in which the conventional coil spring seat construction is to be replaced by a nest of 28 to 30 leaf springs mounted on a tubular frame.

It is claimed that this type of seat construction makes possible a very important weight saving, ranging from 25 to 40 per cent of the total weight of the present seat, which makes possible a net saving of from 25 to 50 lb., for a front seat. Better comfort and almost indefinite cushion life are anticipated for heavy-duty seats for commercial vehicles and heavy trucks.

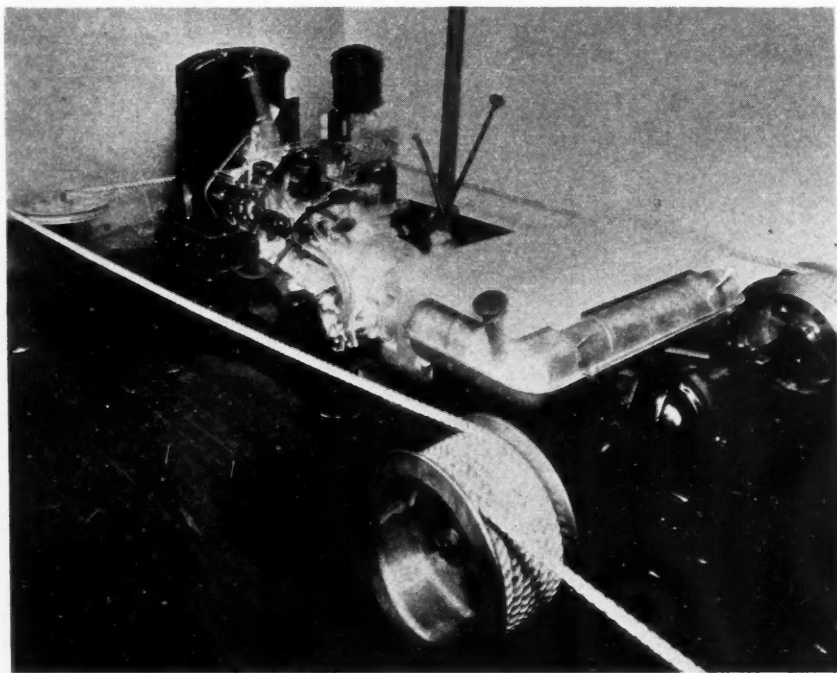
The leaf spring seats are not yet in production but samples are being shown to various manufacturers in the automotive field.

## Hudson January Sales 29% Above 1938 Mark

Retail sales of Hudson cars in the United States for the four weeks ending Jan. 28 were 29 per cent higher than for the same period a year ago. Canadian retail sales for the current period were 64 per cent greater than for the corresponding period a year ago.

## DeSoto Under Way With Spring Sales Clinics

DeSoto sales executives, headed by L. G. Peed, vice-president, began this week a series of spring sales clinics with dealers in 30 key cities throughout the United States.



Acme

## Get a Lift with a Chrysler

Recently placed in operation near Vanderbilt, Mich., is this new type ski and toboggan lift devised by the Industrial Engine division of the Chrysler Corp. The lift operates an endless rope which the skier may grasp at the foot of the slide to be pulled back. A standard heavy-duty transmission and rear axle are used. Speeds up to 12 m.p.h. are said to be practicable.



## Hungary May Undertake Construction of Aircraft

Construction of airplanes in Hungary will be started in the near future, according to a report in *Aeronautical World News* published by the Automotive-Aeronautics Trade division, Department of Commerce. It is said that production will begin in four of the leading manufacturing plants in the country. These are the Royal Hungarian State Iron, Steel and Machine Mfg. Co., Weiss Manfred Plant, the Gyory Waggon Mfg. Co., and the Magyar Waggon and Machine Mfg. Co.

## Pontiac Dealer Meeting Will Be Held on Feb. 6

Pontiac's first regular monthly dealer meeting for 1939 will be held on Feb. 7, according to C. P. Simpson, general sales manager. Twenty-three dealers, one from each of the company's zones, plus the four regional managers and one zone manager from each region will be in attendance. Monthly dealer meetings are in line with Mr. Simpson's policy of giving dealers an active voice in merchandising plans, and were originated in 1934.

## Henry W. Dammann

Henry W. Dammann, secretary and treasurer of the Bear Mfg. Co., Rock Island, Ill., died very suddenly Jan. 31. Mr. Dammann, who with his brother William founded the Bear Mfg. Co. many years ago, was well known in the automotive industry, in connection particularly with wheel alignment problems. He was 63 years old.

## New Truck Registrations

New truck registrations for the month of December, 1938, numbered 31,474—an increase of approximately 31 per cent over the previous month. The December total was just 65 units above the figure reported for December, 1937. The showing for the 12 months of 1938 as compared with 1937 is indicated by a minus 41 per cent.

	December	November	December	TWELVE MONTHS		Per Cent	Per Cent of Total	
	1938	1938	1937	1938	1937	Change, 12 Months over 1937	1938	1937
Chevrolet	12,125	9,333	10,505	119,479	183,674	- 34.9	32.70	29.71
Ford	8,509	5,725	7,828	100,959	199,376	- 47.2	27.63	30.63
International	3,932	4,088	4,356	55,836	76,174	- 26.8	15.28	12.32
Dodge	2,598	1,088	3,539	33,656	64,098	- 47.5	9.21	10.37
G. M. C.	1,769	1,211	2,050	20,152	43,522	- 53.9	5.52	7.04
Plymouth	306	176	710	6,652	13,709	- 51.5	1.82	2.22
Mack	423	349	314	4,406	5,513	- 20.1	1.21	.89
Diamond T	287	490	383	4,393	8,118	- 46.0	1.20	1.31
White	288	302	321	3,514	5,933	- 40.8	.95	.96
Reo	197	229	254	2,929	4,254	- 31.0	.80	.69
Studebaker	164	141	186	2,000	5,129	- 61.0	.55	.83
Willys-Overland	118	103	184	1,889	1,122	+ 68.1	.52	.18
Autocar	106	147	150	1,617	2,181	- 25.9	.44	.35
Federal	98	101	95	1,370	2,339	- 41.4	.37	.38
Brockway	102	124	102	1,303	1,593	- 18.2	.36	.26
Divco	78	106	27	1,229	1,125	+ 9.1	.34	.18
Hudson	28	31	91	719	4,823	- 15.0	.20	.76
Indiana	21	34	58	435	1,371	- 68.3	.12	.22
Stewart	32	14	50	390	1,148	- 66.0	.11	.19
F. W. D.	17	9	23	274	435	- 37.0	.07	.07
Sterling	32	26	10	267	311	- 14.1	.07	.05
Pontiac	26	8		243			.07	
Stutz Pak-Age Car	14	4	28	111	610	- 81.8	.03	.10
Miscellaneous	204	104	145	1,525	1,691	- 10.0	.42	.27
Total	31,474	23,943	31,409	365,349	618,249	- 41.0	100.00	100.00

## Charcoal

Experts of the Japanese Commercial and Industry Ministry are shown here as they recently inspected the operating mechanism in the rear of one of the charcoal-burning automobiles now on display at the Akasaka Public Hall in Tokyo.



Acme

## Aeronautic Exports Up 73 Per Cent in 1938

*Industry's Largest Market Development Found in Australasia Region Last Year*

Exports of aeronautic products from the United States during December amounted to \$5,696,612, as compared with \$3,906,882 in December, 1937, according to a report made public by the Department of Commerce, automotive-aeronautics trade division. Total exports for the year, the report stated, amounted to \$68,209,050—an increase of 73 per cent over 1937.

Aircraft represented the largest item of export in 1938, amounting to \$37,-

977,924 or 56 per cent of the total, followed by parts and accessories with 32 per cent; engines represented 12 per cent.

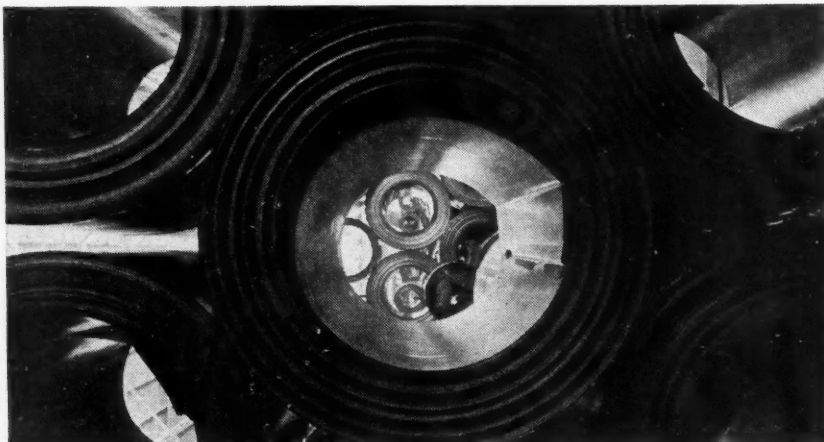
It is estimated that the industry sold abroad in 1938 almost half its total output computed on a value basis; this compares with an average of 33.3 per cent in recent years. While total production advanced about 22 per cent, overseas trade eclipsed the 1937 record by more than 73 per cent.

The most interesting development was said to be the 81 per cent increase to almost \$22,000,000 in the value of parts and accessories sold abroad; this represented not only an increase in the quantity of planes going abroad in knock-down or semi-finished state but also of items for inclusion in aircraft of foreign design.

The biggest market development during the year occurred in the Australasia region which, among others, embraced the leading markets of China, Netherland Indies, Hong Kong, Japan, Siam, the Philippines and Australia. This region, which for a number of years past has absorbed one-third of the total exports in this class, increased its 1938 purchases by 172 per cent, which was 44 per cent of the total.

Latin America, the report stated, which back through 1933 has been a customer for 28 per cent of the aeronautic products exported from the U. S., increased its takings by less than 20 per cent in 1938, thus accounting for only 19 per cent of the total of these exports.

Export orders now on the books of American manufacturers and additional such business which presumably will soon be closed appear to give assurance that 1939 will attain new record levels.



### Modernism

What appears at first glance to be a modernistic and thoroughly bewildering photograph is simply a view through a coil of steel in the stock room of the Ford Motor Co.'s new Press Shop. This shop is one of two gigantic projects placed in operation early in January. A feature story on the major units in the \$34,000,000 expansion program of the company will appear in an early issue of *Automotive Industries*.

## Steel Buying Move Expected Before End of Current Month

### *Metal Markets' Field Men Report Light Stocks in Consumers' Hands*

The American Iron and Steel Institute revised this week its basic figures of the steel industry's capacity for producing primary steel in the form of ingots. Capacity now is rated at 72,533,969 gross tons a year, an increase of 1,468,429 tons. On this basis this week's rate of employed ingot capacity is given as 53.4 per cent, denoting an increase of around 20,000 tons over the preceding weeks rate of output. While shipments of sheets and strip steel to automobile manufacturers and parts makers continue in a routine way, most finishing mills have whittled down their backlogs to the point where receipt of fresh orders and specifications is anxiously awaited, so as to permit a continuance of rolling and finishing operations at the prevailing rate. Bolts, nuts and rivets are moving in a routine way, with prices steady. Some small lot business in cold finished carbon and alloy steel bars is also coming through. Steel company sales managers say that their field men report stocks in consumers' hands as very light and are confident that the prevailing lull will give way to a buying movement before the end of the month.

Most of the non-ferrous metal markets are marking time pending a clearer view of the situation in Europe. Spot Straits tin was offered at the weeks beginning at 46 cents with buyers showing very little interest. The world's visible supply of tin increased in January approximately 10 per cent over December, standing now at 34,240 tons.

American copper producers have cut their output to the extent of approximately 10 per cent and some foreign producers have made even sharper cuts. In the outside market 10½ cents was asked for spot electrolytic, while the large producers continued to quote 11¼ cents, at which figure, however, their business was almost entirely restricted to transactions with their fabricating subsidiaries. Lead has turned dull following January shipments of more than 40,000 tons.—W.C.H.

### Early Truce May End Reo Control Contest

The contest for control of the Reo Motor Car Co. appeared to be headed toward a truce this week which would result in withdrawal of a petition for reorganization under Section 77-B of the National Bankruptcy Act. If the anticipated withdrawal of the petition is made, the case would revert to an Ingham County circuit court where a group of stockholders filed a petition for receivership on Dec. 13. This petition had been superseded by the reorganization petition filed in Federal Court by the present management.

During hearings on the reorganization petition in the U. S. District Court in Detroit this week a statement signed by a group of the company's foreign distributors warned that unless affairs of the company were settled promptly so that production could be resumed,

these distributors would be forced to give up their franchises in favor of trucks of foreign manufacture. It was pointed out that approximately 45 per cent of the company's sales were for export.

"For the sake of the company," Judge Arthur F. Lederle recessed the hearing and asked attorneys representing the several contending factions to meet together for a possible out-of-court settlement. Depending on outcome of this conference was continuance of the hearing as well as the appointment of a trustee to replace A. J. Brandt, who resigned as temporary trustee on Feb. 6, after his right to the trusteeship had been challenged in petitions filed with the court by the Securities and Exchange Commission and several groups of stockholders on the grounds that he was not a disinterested party. Among these was one filed by Howard A. Flogaus, former vice-president and chief engineer of the company.

Following a meeting of the present board of directors in Lansing on Feb. 4, election of the following additional directors was announced by Thomas Campbell, chairman: Arthur J. Morris, president of Morris Plan Industrial Bank, New York; Col. E. J. Hall, former vice-president and general manager of Hall-Scott Motors, California; Charles W. Matheson, former vice-president and director of sales at Dodge, DeSoto and Graham-Paige. Matheson also was elected president and general manager.

### Willys Price Rumor Starts Stock Flurry

Willys Overland Motors, Inc., shares in the New York Stock Exchange led in volume of trading on Wednesday due in part to a report on tickers that the company is making a deal with union workmen to reduce costs of manufacture with view to lower the prices of cars. Joseph W. Frazier, president of the corporation, declined to comment on the report. Richard Gossler, president of the UAW local 12, said the union had made no deal of any kind. A union contract was made last August, he said, and is in full force.

### Grumman Contract

The Treasury Department announced on Wednesday the award of a contract by the U. S. Coast Guard to the Grumman Aircraft Corp. for three 8-passenger twin-engine amphibian planes. Cost was set at \$204,000.

### Allis-Chalmers Sales Reported Quickening

Tractor and farm equipment sales of the Allis-Chalmers Mfg. Co., Milwaukee, have quickened remarkably in recent weeks, following a psychological reaction on the farmers brought about



by low wheat and corn prices, according to Harry C. Merritt, vice-president in charge of the tractor division. Allis-Chalmers' inventory of farm tractors and implements at the beginning of this year was about \$3,000,000 less than a year earlier, with prospects such that it is deemed wise to build up inventory as well as dealers' stocks. All tractor division plants are currently running full time, it is reported.

## Census Report On Parts - Accessories

Stamped and pressed automotive parts and accessories to the value of \$97,261,804 were produced in 1937, according to the Bureau of the Census. The Bureau explained that the figure of \$114,632,611 given for 1935 is not strictly comparable with that for 1937 because some manufacturers in the automobile industry reported this item as automobile stampings in the earlier year but as knockdown assemblies in the later year.

The output of motor-vehicle skid chains declined to 28,235 net tons in 1937 from 30,894 tons in 1935.

## Truck Contracts

Motor truck contracts aggregating \$92,947 were awarded by the government during the week ended Feb. 4, the Farm Security Administration purchases amounting to \$82,630. Treasury Department purchases made up the remainder. The contracts went to the Fargo Motor Corp. and the International Harvester Co. The TVA awarded contracts, totaling \$11,447, for sedans to the Chevrolet division of General Motors Corp.

## Ryan Contracts

Ryan Aeronautical Co. reports signing of new contracts totaling approximately \$95,000 for exhaust collector rings, engine cowlings and other specialized products for aircraft with leading aircraft manufacturing companies.

Equipment is for installation on Army bombers, Navy fighters and Navy bombers as well as transport bombers being constructed for the Australian government. The parts are for Lockheed Aircraft Corp., Douglas Aircraft Co., Consolidated Aircraft Corp., and Brewster Aeronautical Co. Ryan also announced the delivery of a second quantity order of Ryan S-T-M military training planes to the Guatemalan government.

## A. T. Nelson

Arne T. Nelson, machine designer in the automotive industry in Michigan for many years and assistant superintendent of the glass plant of the Ford Motor Co. died while at his work on Monday. He had been in the employ of the Ford company since 1927.

# Factories-Dealers Urged to Start Complete Reform from "Within"

**Trade Association Head Asks Action By Producers and Finance Companies**

There has been an evolution in trade association activities, so that today factory-dealer relations are of paramount consideration to the association. So stated Claude S. Klugh, manager of the Pennsylvania Automotive Association, in an address on Tuesday before the Ohio Automotive Association convention in Columbus.

In discussing factory-dealer relations, Mr. Klugh said, "There is a tendency on the part of some factories to give more consideration to the betterment of factory-dealer relations. The conference table method of approaching problems is preferred by some dealers to legislative control. Relations between some dealers and some factories are definitely better—and it is high time.

"... We need fewer and better dealers whose factories respect their financial investment, and their ability to perform under normal and reasonable conditions. In 1934 we had 1306 dealers in Pennsylvania who sold less than 10 new cars. Of this number 958 sold less than five new cars, and 348 sold from six to 10 new cars. I am won-

dering if the picture in 1938, four years later, will be much different.

"Until such time as all factories set up certain definite standards for dealers we will continue to see the appointment of wildcat, cross-selling operators, who are a menace to sound merchandising of one of the most popular products ever manufactured.

"As a basis for factory action we might recommend the following: 1. Sound and practical accounting systems that at all times will reveal the true conditions as they actually exist. 2. Elimination of dual, or more representation, which a trading area cannot support on a profitable basis. 3. Higher penalties, as the plans develop, on all sales made by dealers of the same make cars, in other trading areas. 4. That dealers make a gross profit over and above their reconditioning costs, on all used cars sold. 5. That factory field representatives be thoroughly trained on sound business administration, and the building of customers' good will. 6. Every effort be made on the part of the factories to eliminate such unethical practices which tend to demoralize the public opinion of automobile dealers as a whole—such as—padded finance charges, loaded delivery charges, misrepresentation in advertising, etc. 7. Service promotional work that will tend to build customer respect for dealer's service operation."

In speaking of the "evils" of time sales financing, Mr. Klugh scored "packing" in connection with automobiles sold on time. "Manufacturers spend millions of dollars," he said, "to develop high-speed machinery, dies and other equipment, to reduce the f.o.b. price of the new model—\$5, \$10, or \$15 to meet f.o.b. price of competition, yet no control of the delivered price of the car is exercised by many companies.

"Unless factories, finance companies, and better class dealers join together very shortly, in an endeavor to lick 'packing,' we will soon reach an all-time low as automobile dealers, in the point of respectability.

"I fully believe a day of reckoning is coming. In our state dealers only await the cooperation of the factories and the finance companies. Whether they are sufficiently interested to strive to eliminate the now prevalent practice of 'gypping' the customer, remains to be seen... needless to say, we cannot do the job alone.

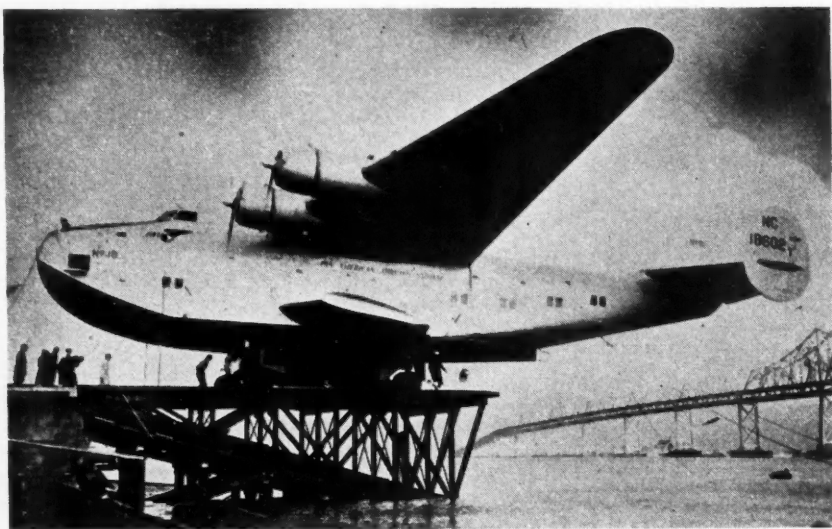
"However, if they... I refer to finance companies and factories... prefer to allow reform to come to us from without, they have no one to blame but themselves if the cure is distasteful to them."



**"Wild Bill" Cummings**

... recognized as one of the country's outstanding race drivers died early Wednesday from injuries received when a passenger car he was driving plunged down a roadside embankment near his home in Indianapolis. Cummings, a competent driver known for "using his head" as well as his "lead foot," won the Memorial Day 500-mile race at Indianapolis in 1934.





### In for a "Once-Over"

Bringing the world's largest commercial seaplane into a hangar for a check-over is a tough job which the air-marine terminal at Treasure Island in San Francisco Bay must be prepared to handle regularly. Here's the 42-ton Boeing Clipper being brought ashore by a combined railroad and elevator for a check during its series of test flights prior to going into service. Third of the six clipper planes being constructed for Pan-American Airways has just been launched in Seattle. It will soon join its predecessors at Lake Washington for tests.

Aeme

## Optimistic Automotive Outlook Boosts Tire Output Estimate

### Replacement Sales This Year May Reach Total of 32,000,000 Units

With the Department of Commerce quarterly tire stock census as of Jan. 1, 1939, showing that retail tire stocks in the United States declined by 467,000 units during 1938, and with tire manufacturers' figures showing net shipments for replacement purposes during the year of approximately 29,850,000 units, it becomes apparent that total consumer purchases of tires for replacement purposes last year exceeded 30,300,000 units. This is a figure substantially above all previous estimates for the year.

Total shipments of tires last year amounted to 42,395,000 units. Original equipment deliveries were approximately 11,500,000 units and official exports were 1,048,000 units, leaving net shipments for the retail market of approximately 29,850,000. Total retail stocks Jan. 1, 1939, were 5,506,000 units against 5,973,000 on Jan. 1, 1938—a decline of 467,000 units.

Stocks of the larger independent tire dealers were 1,758,000 Jan. 1 of this year against 1,938,000 a year ago. Stocks of 47 oil companies distributing tires through more than 40,000 outlets, were 1,838,000 against 2,115,000. Stocks of five tire manufacturers with 2080 wholly owned stores, and of seven chains and other mass distributors with 1,817 stores were 1,910,000 against 1,920,000.

Due to abnormally heavy dealer buying in the final quarter of 1938, manufacturers were fearful lest dealers were replenishing stocks too rapidly, with consumer buying lagging. But the government report shows that from Oct. 1, 1938, to Jan. 1, 1939, total retail stocks increased only 13,000 units or from 5,493,000 to 5,506,000 units.

Manufacturers' inventories Jan. 1 were 8,497,932 units compared with 10,383,235 units on Jan. 1, 1938.

Revelation of the fact that consumer tire buying last year exceeded 30,300,000 units and was far ahead of all estimates for the year, strengthens predictions that total replacement sales in 1939 will exceed 31,500,000 and may reach 32,000,000. Original equipment sales this year are expected to be at least 16,000,000 units, against 11,500,000 last year and 22,600,000 in 1937.

Optimistic reports from the automotive industry have resulted in the rubber industry raising estimates of tire production in the first quarter. Many manufacturers now believe tire output during January and February will exceed the December production of 4,678,878 units.

It is recalled that the Rubber Manufacturers' Association recently expressed the belief that stocks carried over into 1939 were insufficient.

## 40 Years Ago

The road vehicle and the track vehicle are two separate and distinct classes of vehicles which cannot, to any degree, conflict with each other. The nature of its roadbed, and the fact that it has and must continue to have, the right of way, give the track vehicle an inherent advantage over the road vehicle with respect to speeds and the transportation of heavy loads over considerable distances. The attempt to make the road vehicle a competitor of the track vehicle must, therefore, except in rare instances, end in failure, as it is a false and foreign line of development. As a feeder of the track vehicle, or supplementary to it, however, the road vehicle will find its chosen field. Where the track vehicle alone is unable to handle the traffic and where there are large districts lying beyond, or away from its scope, the motor vehicle will be profitably employed.

Money and time will be saved if the limitations of the road vehicle are studied, as well as its strong points.—From *The Horseless Age*, February, 1899.

### U. S. New Passenger Car Registrations and Estimated Dollar Volume by Retail Price Classes\*

	NEW REGISTRATIONS			ESTIMATED DOLLAR VOLUME		
	December	Twelve Months		December	Twelve Months	
		Units	Per Cent of Total		Dollar Volume	Per Cent of Total
Chevrolet, Ford and Plymouth	123,651	1,097,414		\$89,500,000	\$820,800,000	
Others under \$1000	78,993	454,624		72,900,000	417,200,000	
\$1001-\$1500	21,548	286,197		25,500,000	321,900,000	
\$1501-\$2000	1,225	14,579		2,000,000	24,300,000	
\$2001-\$3000	1,345	8,421		3,000,000	21,400,000	
\$3001 and over	70	1,088		300,000	5,200,000	
Total	226,832	1,862,323		\$193,200,000	\$1,610,800,000	
Miscellaneous	141	1,397				
Total	226,973	1,863,720†				

\* All calculations are based on delivered price at factory of the five-passenger, four-door sedan, in conjunction with actual new car registrations of each model. The total dollar volumes are then consolidated by price classes.

† Data from Wisconsin not complete.

## What Next?

Japanese manufacturers of motor cars have evolved a novel method of production in an attempt to exploit the Latin American market with a cheap automobile, according to Hans Otto Strom, author-engineer, recently returned to California from Lima, Peru. Strom was deported by Peruvian officials because, he explained, the government took exception to a book he had written on Peru.

"The motor cars I observed in Lima that came from Japan were small, cheap and extremely light, hence required little power for propulsion," Strom said.

"The cars were lighter than any other automobile I have ever seen because the body was made of some type of paper. As it did not rain during the period I observed these cars, I am not in a position to know what happened when saturation ensued."

## Le Tourneau '38 Profit Totaled \$1,400,000

R. G. Le Tourneau, Inc., California heavy dirt moving equipment manufacturer, made a net profit in 1938 of \$1,400,000, or in excess of \$3 a share on 450,000 shares outstanding.

## Taylorcraft Plant Planned in England

An aircraft plant to manufacture the two-place Taylorcraft of American origin is being established in Leicester, England, it is reported in the January issue of *Industrial Britain*. The planes will be built principally for Civil Air Guard purposes.

Plans are said to have been made for a production of 200 planes per year. Complete jigs and tools are reported to be on their way from America. The company is known as Taylorcraft Aeroplanes, Ltd.

## Ex-Firestone Employees Sue for Reinstatement

A precedent in labor relations between management of the tire industry and the United Rubber Workers Union of the CIO has been established by the filing in the Summit County Common Pleas Courts in Akron, Ohio, by 15 discharged Firestone workers, of a suit against the Firestone Tire & Rubber Co. to compel the company to re-hire the men involved. The 15 employees themselves are the plaintiffs in the unprecedented action. Union officials claim the URW Firestone Local is not a party to the action.

The suit seeks to have the courts enforce terms of the URW-Firestone con-

tract and charges that the men have been laid off "solely and wholly for the purpose of replacing plaintiffs with other persons contrary to provisions of the contract." The section of the Firestone-URW contract is cited, which says that layoffs may be put into effect only after a department has been reduced to an average of 24 hr. a week for eight weeks. The petition charges that such a condition had not occurred prior to the layoffs in question.

No date has been set for hearing by the Common Pleas Court.

## Tire Workers Urge AFL-CIO Peace

Peace between the American Federation of Labor and the Congress of Industrial Organizations was urged in a resolution adopted unanimously Feb. 5 by Goodrich local, United Rubber Workers of America.

A proposal that a nine-man committee be set up to work out a peace plan was contained in the resolution.

The group would be composed of three persons from each group and three from the federal government. The union called on other rubber locals and all other labor organizations to back the drive for peace.

L. L. Callahan, Goodrich local president, reported to members that within a few days a tentative agreement with the B. F. Goodrich Co. is expected to be drafted and that it will be printed and distributed to members for their consideration.

He also reported progress in the attempt to iron out a disagreement over the eligibility of a group of employees for rehiring.

## Hayes Steel Products Calls Mortgage Bonds

Hayes Steel Products, Ltd., has called the outstanding balance of its 6 per cent first mortgage bonds for redemption on April 1, 1939, at 102½ plus accrued interest to that date. The company made some reduction in its funded debt during the first half of 1938, bringing the outstanding balance to less than \$200,000.

It has sold its Chatham, Ont., plant to the Chrysler Corp. of Canada, Ltd., Windsor, Ont., for about \$100,000, and it is understood that this was intended to be applied toward payment of the bonds.

## Tire Taxes

American tire and tube manufacturers last year paid the government a total of \$22,082,300 and \$4,688,500 in excise taxes on tires and tubes respectively. In 1937 total excise tax payments amounted to \$35,500,200 on tires and \$6,587,700 on inner tubes.

## Traffic Men Study Rates And Proposed Legislation

At a meeting in Detroit on Feb. 2, traffic managers of automobile companies—members of the Automobile Manufacturers Association—discussed reports on the progress of legislation at Washington aimed to improve transportation conditions. The meeting took no formal action on these matters pending the introduction of further bills on the subject by Senator Wheeler, which it is understood will contain proposals that may differ somewhat from those contained in the Lea Bill.

J. S. Marvin and K. A. Moore of the A.M.A., and C. R. Scharff, director of traffic, Chevrolet Motor Co., are members of the executive committee of the National Industrial Traffic League, which is also closely following these developments and will probably participate in the Congressional hearings. Mr. Marvin is also a member of the League's Special Committee that is conducting meetings with a corresponding committee of Railroad Presidents.

## Goodrich Executives Hold Conferences in California

Executives of B. F. Goodrich Co., headed by C. B. O'Conner, general tire sales manager, were in San Francisco last week to hold a series of conferences with field men in the area. P. C. Henderson, advertising manager, and F. J. Rees, national promotional manager of the company, were in the party.

Discussing the 1939 outlook for the tire industry, Mr. O'Conner said that Goodrich anticipates a sales volume of 50,000,000 tires this year, or about 15 per cent more than the 1938 volume. Average tire cost of American automobiles this year is estimated at about \$17.



## Crash-Belt

C. J. Strickland of the automotive products section of General Electric Co., who is also president of the Automobile Safety League of America, shown with the airplane type of safety belt which he advocates for use in automobiles.

# Manufacturer-Dealer Report To Be Submitted in April

*Ourselves and Government—A Check List  
Of Federal Action Corrected to Feb. 9*

## DEPARTMENT OF LABOR

**STEEL WAGE DECISION.** Representative Walter, Democrat, of Pennsylvania, has announced he will press his bill which would give steel interests the right to appeal to court for a review of the Labor Department's order fixing steel wages, effective March 1. Protests against the order have been particularly vigorous from Eastern steel manufacturers who under the order would be required to increase common labor wages to the maximum of 62½ cents an hour.

## FEDERAL TRADE COMMISSION

The Federal Trade Commission report on manufacturer-dealer relationship in the automotive industry will be submitted to Congress in April. This was announced by Chairman Ferguson, of the Commission, in the course of recent hearings on the FTC Appropriation Bill.

The study was begun by the economic unit of the Commission under the Withrow Resolution soon after its passage on April 13, 1938, and has been continuous ever since. The resolution called for a report to Congress within

one year. The investigation entailed a country-wide contact between staff members of the Commission and automobile manufacturers and dealers.

The resolution called for investigation of policies employed by manufacturers in distributing motor vehicles, accessories and parts and the policies of dealers in selling motor vehicles at retail.

Sponsors of the legislation charged that alleged compulsion exercised by manufacturers had forced large numbers of retailers out of business.

**F.O.B. PRICE CASE.** Hearings are due in the Ford case but no specific date has been set. It had previously been fixed for Jan. 25 but was cancelled. The Commission is expected to close its case after the hearings. Date for GM hearings in Detroit has been fixed for Feb. 21. The FTC alleges in the proceeding that price advertising was misleading.

**SIX PER CENT CASE.** The FTC brief in the GM case has been filed. The respondents now have an opportunity to reply, after which final arguments will be scheduled. Final argument in the Ford proceeding is due to be scheduled soon.

**VS. UNITED STATES RUBBER CO.** Respondents have asked for additional time to reply to the complaint and have been given until March 1. The FTC alleges unlawful price discrimination in the sale of tires in violation of the Robinson-Patman Act. Also involved is the United States Tire Dealers Corp. of New York, a subsidiary.

**VS. GENERAL MOTORS.** No new developments since report in *AUTOMOTIVE INDUSTRIES* issue of Jan. 21.

## Men

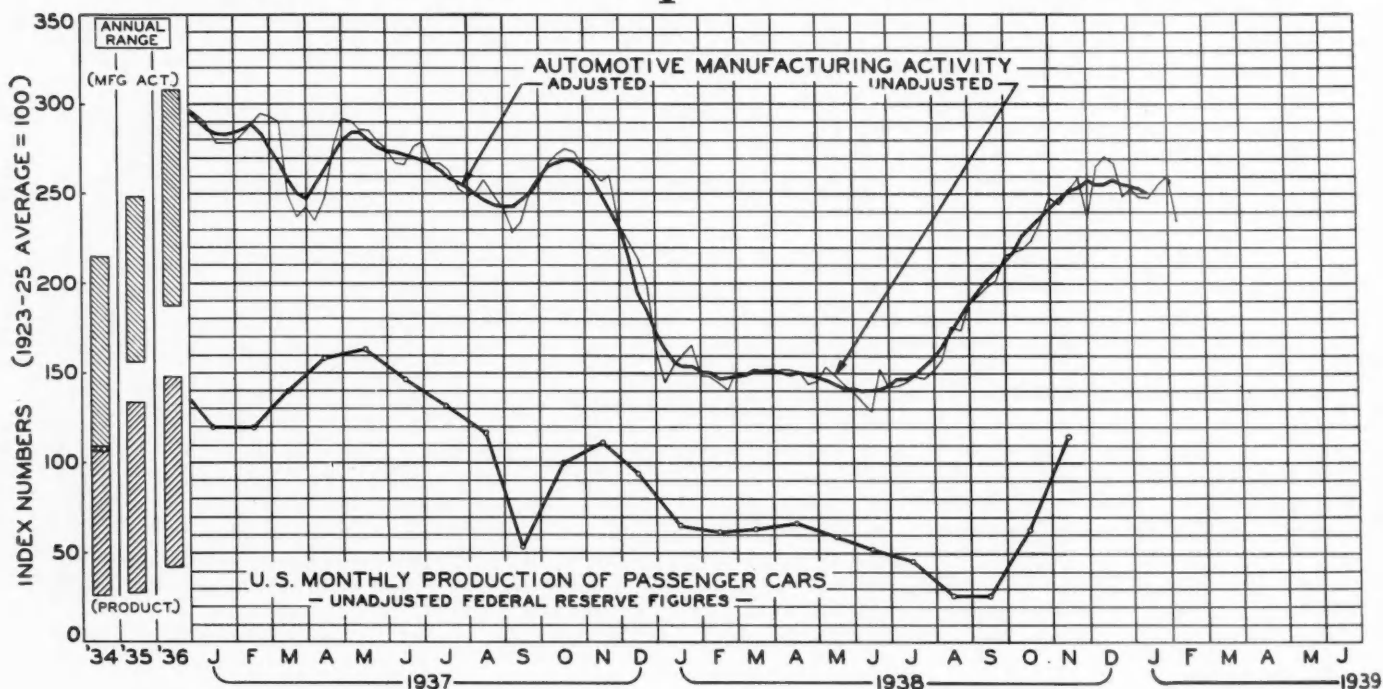
**Rex DeLong**, formerly northwest sales manager of the E. F. Houghton Co., will head the newly created processing materials division of Pacific Machinery & Tool Steel. The company was recently appointed northwest distributor of G. S. Rogers & Co.'s specification products.

**Keith C. Bowers** has been appointed sales representative in western Missouri and Kansas for Revere Copper & Brass, Inc.

**L. E. Peck** has been appointed Midwest district sales manager of the Lake Erie Engineering Corp.

**V. F. Lassagne** has retired from active service as general patent attorney for the International Harvester Co. His successor in that position is **Paul O. Pippel**, formerly assistant manager of the patent department. **R. D. Acton** has been promoted to succeed Mr. Pippel.

## Automotive Index Drops 25 Points to 235 Level



Showing only a slight reaction to seasonal factors and influenced by plant closings due to impossibility of delivery in heavy snowfalls, the unadjusted index of automotive activity dropped 25 points from the Jan. 28

mark to reach 235 for the week ending Feb. 4. The adjusted index moved downward to 250, two points below the posting for the previous week, to continue the down trend apparent since the posting of Dec. 24.



The retirement of D. C. Giese as chairman of the board, National Screw & Manufacturing Co., has been announced. He will remain as a director. H. G. Alexander has been elected board chairman and H. P. Ladds has been named president and a director.

Appointment of William J. Rutledge to the retail merchandising department of the Nash Motors division of Nash-Kelvinator Corp. has been announced. He will concentrate on building up of retail sales organizations and the supervision and training of salesmen.

James P. Denvir, for the past several years with General Motors truck fleet sales division, is now associated with United States Rubber Co., handling truck tire sales in the New York Metropolitan area.

Universal Credit Co. has announced the election by the board of directors of the following new vice-presidents: R. F. Given, C. Tiedeman, H. C. Butkiewicz and H. A. Metcalf.

Erling Winsner, since 1930 manager of the district office of the Allis-Chalmers Mfg. Co. in Santiago, Chile, has been advanced to the managership of the entire South American territory with headquarters in Buenos Aires.

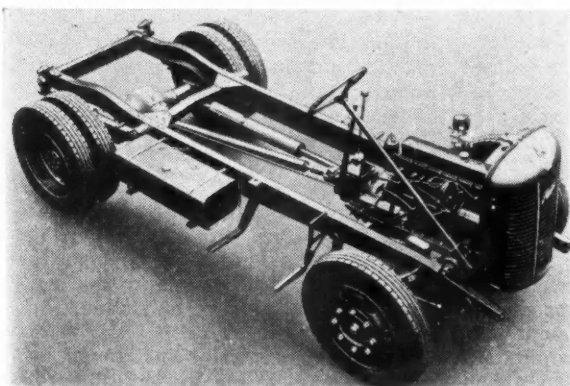
J. C. Hammond has been appointed manager of national account sales for the National Battery Co.

W. Ledyard Mitchell, vice-president of the Chrysler Corp. in charge of its international business, has sailed from Los Angeles to make a survey of automobile markets and general business conditions in the Hawaiian Islands, Australia and New Zealand.

Henri Petit, technical journalist and editor of *La Vie Automobile & Aérienne*, has been nominated as president of the French Society of Automotive Engineers. He succeeds Pierre Prevost.

## Austin Re-enters Motor Truck Field

Using the same engine in all cases, the Austin Motor Co., Ltd., Birmingham, England, announced on Feb. 1 a new line of trucks, three in all, for 1½-, 2- and 3-ton loads with 50 per cent "permissible overload." They mark in each case the re-entry of Aus-



### Austin

Chassis of the new Austin 3-ton short wheelbase model for hydraulic tipping body.

## AUTOMOTIVE INDUSTRIES

Summary of Automotive Production Activity  
(Week Ending Feb. 11)

**BUSES** One large producer reports rise in rate due to past orders having passed the "drawing board" stage and now in actual production. Another manufacturer said to be closing several large orders in southern states. Outlook for the year continues to be optimistic.

**TRUCKS** Little change since last week. Deliveries of single units and small orders continue, with several large inquiries reported. Several producers state they are still of the opinion that this year looks exceedingly good.

**TRACTORS** Production schedules, which many manufacturers felt to be set a little high at the beginning of the year, now appear to have been just about right. Producers closely watching commodity prices for future sales indications. As to outlook, "anybody's guess is good" appears to be the general feeling.

**AUTOMOBILES** This week's output estimated up 2000 units to reach approximately 82,000. January retail deliveries, although seasonally lower than December, continue to show gains over the same month a year ago.

**MARINE ENGINES** Diesel output reported running strong. Distributors are still optimistic and report a fairly good business.

**AIRCRAFT ENGINES** Even without the prospective large buying of aircraft by the Army and Navy, factories are still running at peak capacity, several makers report.

*This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.*

(Copyright 1939, Chilton Co., Inc.)

tin into this field after an interval of about 25 years, for not since production of a 3-4 ton model discontinued at the beginning of the World War has anything in the industrial vehicle line been manufactured by this firm, apart from light delivery vans on passenger car chassis.

## Survey Reports On Retreading in 1938

Approximately 4,700,000 tires were retreaded and recapped in the United States last year at a consumer cost of \$28,000,000, according to a special survey made by the Machinery Division of the Department of Commerce. The survey estimates \$2,000,000 worth of new tire retread and recap equipment sold last year, and also estimates that 20 per cent of trucks and 5 per cent of passenger car tires in America are now equipped with retreaded or recapped tires. This is the first survey ever undertaken of the tire renewing industry.

The survey estimates there are 3500 retreading shops in the United States and 631 in other countries.

## Publications

A new catalog issued by Chicago Metal Hose Co. describes its Rex-Weld and Rex-Tube flexible metal hose.\*

A folder issued by the Foxboro Co. describes its potentiometer indicating recording controller.\*

An eight-page bulletin which describes Glyco Babbitt, a bearing metal product of Joseph T. Ryerson & Son, Inc., has been issued by the company. Included are recommended applications for the various grades of Glyco carried in Ryerson stock.\*

A composite catalog, covering the entire "Caterpillar" line, has been issued for 1939 by the Caterpillar Tractor Co. The booklet gives brief specifications and operating data about every product built by the company.\*

An eight-page catalog section on its line of heavy-duty truck and bus and Diesel starting batteries has been prepared by the B. F. Goodrich Co., Akron, Ohio.\*

"80 Ways to Make More Money" is the title of a booklet on filters issued by the Cuno Engineering Corp., Meriden, Conn. A limited number of copies are available for distribution.\*

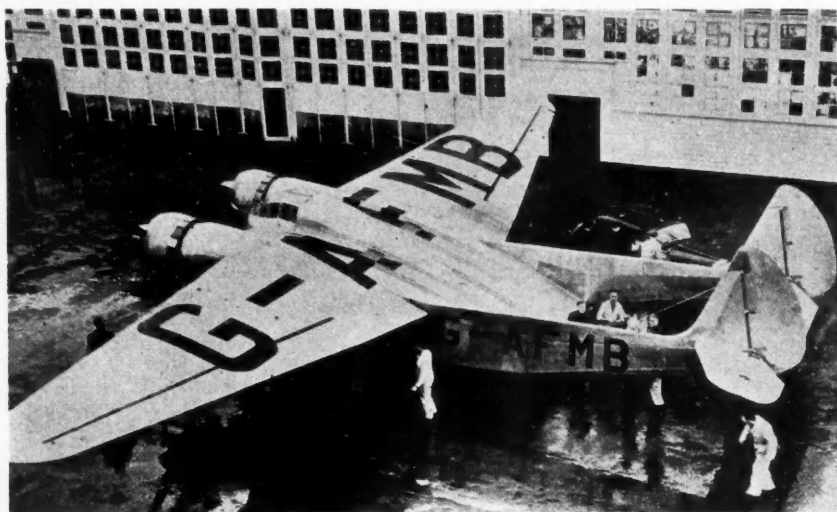
The Lehigh Safety Shoe Co., Allentown, Pa., has issued a new catalog on its line of steel toe safety work shoes.\*

The Chicago Wheel & Mfg. Co., Chicago, has prepared a new catalog containing complete data on the various models of its "Handee Tool of 1001 Uses."\*

Wagner Electric Corp. has issued a 16-page bulletin on its air brakes. The bulletin includes description of the new Wagner rotary compressor.\*

There has recently been issued by the American Society of Mechanical Engineers and the American Society for Testing Materials, jointly, an 864-page compilation of all available creep data on ferrous and non-ferrous metals. Copies may be obtained from either society at \$12 each in the U. S. and Canada.

\* Obtainable from editorial department AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.



Acme

### England's First "Flying Wing"

Said to be the first "Flying Wing" type air liner in Great Britain is this plane built at the Cubliffe-Owen aircraft factory, shown here as it awaited engine tests. It is all-metal with the cabin built amidship in the center of the wing. It seats 15 passengers and was designed for a top speed of 240 m.p.h. with a cruising range of 1250 miles. The plane is reported to be able to lift a load equal to its own weight.

### Aircooled Motors Expands Facilities

A new building, adding about 6800 sq. ft. to the factory of the Aircooled Motors Corp., Syracuse, N. Y., will be used primarily for assembly operations. Production lines in the older part of the plant are being rearranged, with the addition of new machinery, and initial production on a White Co. order for 4500 4CHO-150 Franklin engines is expected to begin in about two weeks, at the rate of 25 engines a day.

Orders on the books for the 4AC-150 aircraft engine include one for 750 units for "Cub" airplanes and one from the "Taylorcraft" organization. Stock sizes of Franklin engines are being offered as standard equipment with Davey compressors.

Work was completed about Feb. 1 for the approved-type certificate on a 60 hp., 171 cu. in. version of the aircraft engine. The engine is a 4-cyl., horizontal opposed job, 3 3/8 in. by 3 3/8 in.

When the present program of the company is completed, it will include expanded test-stand facilities and the installation of eight dynamometers.

### New Company to Offer Consultant Services

Wilder Gutterson and Lewis Roberts have formed the firm of Engineering Products Service, Inc., with offices at 420 Lexington Avenue, New York City, to render engineering service to manufacturers in the field for new products. Their procedure will include a careful study of the client's marketing and pro-

duction equipment and the securing of a newly patented product adaptable to his existing facilities. The new organization will also act as counsel on marketing problems.

In addition to wide patent sources in this country, Engineering Products Service's present foreign connections include Italy, France, England, Japan and Switzerland.

Mr. Gutterson, who has been in the automotive business since 1920, was formerly associated with the American Chain Co., of Bridgeport, Conn., as sales manager, and with Ryerson & Haynes, Inc., of Jackson, Mich. Mr. Roberts was formerly with the H. A. Wilson Co., of Newark, N. J.

### England's '38 Motorcycle Output Off 17,000 Units

The production of motorcycles in Great Britain decreased from 82,000 in 1937, to 65,000 in 1938. Motorcycle production in that country passed through a peak of 148,000 in 1929, and reached a low value of 58,000 in 1933. The decrease in 1938 production was due to a fall in both the home and export demand. New registrations in Great Britain dropped from 57,060 during the 1936-7 fiscal year to 45,041 during the last fiscal year. Exports dropped from 25,351 in 1937, to 18,087 during the first 11 months of 1938.

Germany, it appears, has made strong inroads into the export market for motorcycles. In 1932 her share of the total number of motorcycles exported by the five leading producing countries was only 12.2 per cent, but in 1931 it was 61.5 per cent, while on a value basis her share increased from

12.1 to 51.3 per cent. A large percentage of the motorcycles exported by Germany evidently are of the small, so-called motorized bicycle type.

The U. S. share in motorcycle exports decreased from 7 per cent in 1932 to 4.7 per cent in 1938 on the numerical, and from 10.5 to 8.3, on the value basis.

### Australian Co. Assembles First 650-Hp. Aircraft Unit

Commonwealth Aircraft Corp. at Fishermen's Bend, Melbourne, Australia, has assembled its first 650 hp. American engine which is of the type designated for installation in the aircraft for the Royal Australian Air Force. Sufficient parts for about 40 of these engines have been imported from the United States. The imported engine parts will be gradually replaced with Australian made components as they become available.

## Books

*Industrial Instruments and Changing Technology*, by George Perazich, Herbert Schimmel, and Benjamin Rosenberg. Report No. M-1, Works Progress Administration, National Research Project. Copies may be obtained from Publications Section, Division of Information, Works Progress Administration, Washington, D. C.

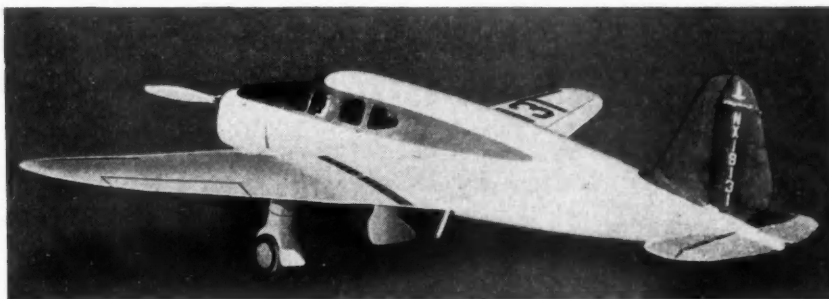
In this report, while the functions of industrial instruments of various kinds are described and the growth of their use is traced, principal emphasis is laid on the economic effects of their use. These instruments increase the productivity of labor in industry by permitting changes in processes, by increasing the productive capacity of machinery, by reducing fuel consumption, spoilage of materials, or machinery stoppages, or by providing records on the basis of which management may improve the utilization of its labor and the flow of work in process.

As an indication of the trend in the use of these instruments, it is pointed out that whereas in 1923 less than 8 per cent of the instruments sold were of the automatic control type, by 1935 more than one-third were automatic controllers. The introduction of these automatic control instruments has been most rapid in the newer industries. Some of the chemical industries are founded on processes which would not be commercial without the use of instruments which accurately measure and maintain operating conditions. It is, of course, particularly the automatic-control type of instrument which has had an adverse effect on labor, because when processes are automatically controlled the number of skilled workers can be reduced.

Although industrial instruments in some cases have had the effect of dis-

placing labor, they play an important role in such new services as radio and air conditioning, and in the production of such articles of commerce as plastics, automobiles and airplanes.

The body of the report is divided into four sections with the following headings: The Role of Instruments in Industry, Instrumentation in Industry, Industrial Instrument Sales, and The Economic Effects of Instrumentation in Industry. To this is added an Appendix covering the following subjects: Principles of Operation of Instruments, Adjusted Census Data, Industrial Instrument Sample, Sales of Laboratory Instruments, Value of Production of Industrial Machinery, Sales of Industrial Instruments, and Distribution of Instrument Sales by Function. The book should prove of interest to production executives.



Acme

### Molded Fuselage

A new process by means of which airplane wings, fuselages and control surfaces can be molded from plastics in mass production was utilized in the construction of the five-passenger plane shown above. The fuselage of this plane—built by the Clark Aircraft Co.—was molded of thin wood, cloth and Bakelite plastic in two hours and thirty-five minutes.

## Graham Sales Executives Touring Distributor Cities

Headed by Robert C. Graham, executive vice-president, a group of Graham sales executives started a tour of distributor cities last week to hold meetings for dealers, salesmen and service managers and introduce a national spring drive which is expected to increase activity in all departments of the retail organization.

Fred E. Bishop, general sales manager; Clare Briggs, director of districts, and W. V. DeGalan, director of service, are accompanying Mr. Graham and covering various angles of the presentation of the drive program.

First meeting was held in Milwaukee on Jan. 31, following which the group moved to Kansas City and then back to Chicago. Other meetings are scheduled for Cleveland, Syracuse, Toronto and Boston, and dates for other distributor points are being decided.

kee on Jan. 31, following which the group moved to Kansas City and then back to Chicago. Other meetings are scheduled for Cleveland, Syracuse, Toronto and Boston, and dates for other distributor points are being decided.

### F. T. Lockwood

Frank T. Lockwood, 73, automobile engineer and designer, died of heart disease in Buffalo, N. Y. He had worked for the Pierce-Arrow Motor Car Co. for 25 years.

Mr. Lockwood was one of the designers of the Pierce-Arrow fender headlights, a marked innovation in motor car designing 20 years ago. Before coming to Buffalo, Mr. Lockwood was a designer at the old Walker Carriage Co. at Merrimac, Mass., for many years.

## GM to Pay 75 Cents On Common Stock

General Motors Corp. has declared a dividend of 75 cents per share on the outstanding common stock, payable March 13, 1939, to stockholders of record Feb. 16, 1939.

The regular quarterly dividend of \$1.25 per share has been declared on the \$5 preferred stock, payable May 1, 1939, to stockholders of record April 10, 1939.

## New Passenger Car Registrations

New passenger car registrations for December, 1938, numbered 226,973. This was an increase of approximately 13 per cent over November and an increase of about 29

per cent when compared with December, 1937. Registrations for the 12 months of 1938 as compared with the year 1937 are indicated by a minus 45.8 per cent.

	DECEMBER	NOVEMBER	DECEMBER	TWELVE MONTHS		Per Cent Change, 12 Months 1938 over 1937	Per Cent of Total Twelve Months		TWO MONTHS MODEL YEAR		
	1938	1938	1937	1938	1937		1938	1937	1939	1938	Per Cent Change
Chevrolet	51,132	52,852	46,311	464,337	766,040	- 39.6	24.56	22.05	103,984	105,415	- 1.5
Ford	37,914	28,672	31,858	363,688	765,933	- 52.5	19.24	21.99	66,586	47,370	+ 40.8
Plymouth	34,605	32,687	22,766	286,241	452,268	- 38.1	15.14	13.27	67,292	49,679	+ 35.2
Buick	18,446	19,385	15,199	166,380	205,297	- 19.0	8.80	5.89	37,831	33,808	+ 11.2
Dodge	17,041	11,028	10,794	104,881	255,258	- 58.9	5.55	7.33	28,069	25,611	+ 9.5
Pontiac	13,582	12,158	9,975	98,399	212,403	- 53.6	5.20	6.10	25,740	22,887	+ 11.2
Oldsmobile	14,021	11,382	9,425	92,398	88,306	- 51.0	4.89	5.41	25,403	20,149	+ 12.6
Packard	4,210	4,857	5,082	49,163	95,455	- 48.5	2.60	2.74	9,067	10,809	- 16.0
Chrysler	6,452	4,345	5,571	46,184	91,622	- 49.6	2.44	2.63	10,797	12,363	- 12.6
Studebaker	4,391	5,077	3,507	41,504	70,048	- 40.7	2.19	2.01	9,468	7,701	+ 23.0
Hudson	4,689	4,718	4,303	40,889	90,043	- 54.5	2.16	2.58	9,407	9,269	+ 1.3
De Soto	4,828	3,257	3,979	35,259	74,424	- 52.5	1.86	2.14	8,085	9,183	- 12.0
Nash	3,695	1,909	3,682	31,814	70,571	- 55.0	1.68	2.03	5,604	7,346	- 23.6
Lincoln	1,907	1,455	2,018	16,991	25,243	- 32.7	.90	.72	3,362	3,440	- 2.1
La Salle	2,369	2,235	1,511	15,732	28,909	- 45.5	.83	.83	4,604	3,439	+ 34.0
Willys	1,117	805	1,956	13,012	51,411	- 74.7	.69	1.47	1,922	4,453	- 56.8
Cadillac	1,398	1,258	635	10,639	11,231	- 5.2	.56	.32	2,656	1,257	+ 111.5
Mercury	4,518	2,317		6,835			.36		6,835		
Graham	406	308	787	4,139	13,984	- 70.4	.22	.40	714	1,360	- 47.5
Hupmobile	62	39	106	1,020	403	+ 153.0	.05	.01	101	232	- 56.5
Bantam	49	58		700			.04		107		
Fiat	23	18		339			.02		41		
Miscellaneous	118	33	147	480	2,903	- 84.3	.02	.08	151	319	- 52.6
Total	226,973	200,853	179,621	1,891,021	3,483,752	- 45.8	100.00	100.00	427,826	376,090	+ 13.6
Chrysler Corp.	62,926	51,317	43,110	472,585	883,572	- 46.2	24.99	25.36	114,243	96,836	+ 11.0
Ford Motor Co.	44,339	32,444	33,876	387,514	791,176	- 51.1	20.49	22.71	76,783	50,810	+ 51.1
General Motors Corp.	100,948	99,270	83,056	847,885	1,414,186	- 30.0	44.84	40.60	200,216	186,955	+ 7.6
All Others	18,760	17,822	19,579	193,040	394,818	- 53.6	9.68	11.33	36,582	41,489	- 12.0



# Both Factions in UAW Dispute File Suits for Union Control

*Progress in Negotiations with Ford Motor Co.  
Halted by Dissension, States Homer Martin*

Law suits seeking control of the affairs of the United Automobile Workers Union, filed by both sides in the dispute that has divided the organization, will be heard by the same circuit court judge in Detroit on Feb. 14, it has been announced.

The CIO endorsed faction opposed to Homer Martin, president of the other faction, had filed a petition for a permanent injunction restraining Martin from controlling the membership, funds and property of the UAW. Martin has replied with a countersuit seeking the same restrictions on his opposition and both suits are scheduled to come up for hearing on the above date.

In filing a reply to his opposition, Martin charged that he had made considerable progress in his negotiations with the Ford Motor Co., his report on which to the international executive board was one of the important causes of the quarrel that led to a divided union, but his reply added that the dissensions, recriminations and actions of his opposition had caused the company to refuse to go further in the matter.

Meanwhile both union camps are proceeding with plans for "official" UAW conventions, the Martin contingent in Detroit on March 4 and his opposition in Cleveland on March 27. UAW locals all over the country have been holding meetings to determine which faction they will support, and both sides are claiming a majority. With important exceptions in each instance, the Martin opposition appears to have its strongest following in Detroit with Martin forces particularly strong in automotive plants away from Detroit. Numerous locals in the Detroit area, however, have also come out for Martin and the opposition also has support of locals away from Detroit. Some

locals, although supporting Martin, are opposed to his anti-CIO position and want the UAW to remain within the CIO. Other groups are still trying to bring about a single convention, but contending leaders appear to be too far apart by this time to make that possible unless some new leaders with the support of a bewildered rank and file comes to the front within the next few weeks.

First steps in this direction may have been taken by a group representing three UAW locals who announced on Feb. 8 that it condemns attempts of Martin to take the union out of the CIO as well as the autocratic rule imposed on the union by the CIO. The group, led by John W. Anderson, vice-president of the Fleetwood local, favors remaining in the CIO and urges all locals to send delegates to the March 27 convention in Cleveland, at which it is suggested that an impartial arrangements committee could insure fair treatment of all delegates, including Martin supporters.

938 in January a year ago. Sales in December were 150,005.

Sales to consumers in the United States totalled 88,865 in January compared with 63,069 in January a year ago. Sales in December were 118,888.

## Senate Passes Truman Bill

*Seeks to License  
All Car Drivers*

The Truman bill, which would prohibit the operation of all motor vehicles in interstate commerce by unlicensed operators, was passed by the Senate early this week after its sponsor, Senator Harry S. Truman, Democrat, of Missouri, estimated that 33 per cent of deaths resulting from automobile accidents in this country could be prevented by making effective strict drivers' license requirements.

In order for states to qualify under the proposed federal standards, they would have to require drivers to submit to eyesight tests, demonstrate ability to read highway and traffic signs; renew license within a three-year period; be at least 16 years of age; and display the license upon demand. It would be unlawful to drive with a fictitious permit and the license would have to give a complete description of the applicant and be revocable by the proper authorities. Violators would be subject to a fine of not more than \$300 and driving a car with out-of-state tags would constitute presumptive, but not conclusive, evidence that the driver was operating in interstate commerce.

The Truman bill was sent to the House for further action. After passage, the law would be effective at the end of four years. The Senate passed an identical bill last session.

## Calendar

### Conventions and Meetings

SAE National Aeronautic Meeting,  
Washington ..... March 16-17  
American Foundrymen's Association,  
Forty-third Annual Convention,  
Cincinnati ..... May 15-18  
SAE World Automotive Engineering  
Congress ..... May 22-June 8

### Shows at Home and Abroad

Berlin, Germany, Automobile Show,  
Feb. 17-March 5  
Sixteenth International Automobile Ex-  
hibition, Geneva, Switzerland, March 3-12  
A.S.T.E. Machine and Tool Progress  
Exhibition, Convention Hall, De-  
troit ..... March 14-18  
Yugoslavia, Belgrade, Automobile  
Salon ..... April 1-8  
Great Britain, London, Automobile  
Show ..... Oct. 12-21  
Great Britain, London, Commercial  
Automobile Transportation Show,  
Nov. 2-11  
Great Britain, Glasgow, Scotch Auto-  
mobile Show ..... Nov. 10-18  
Italy, Milan, Automobile Salon,  
Oct. 25 to Nov. 11

### GM January Sales

January sales of General Motors cars and trucks from all sources of manufacture totalled 152,746 compared with 94,267 in January a year ago, according to a report issued by the corporation this week. Sales in December were 187,909.

Sales to dealers in the U. S. totalled 116,964 in January compared with 56,-

### New Cars Lead

New cars showed a slight lead over used cars in the purchases of small city families in three out of four regions studied by the Bureau of Home Economics, U. S. Department of Agriculture. In the fourth region (4 cities in Georgia, South Carolina, and North Carolina) more than half of the cars bought were used models, and the average gross price was higher than that for used cars in other regions, excepting the Pacific Coast.

These facts were gathered in a 12-month study in 1935-36 of family expenditures under the direction of Dr. Louise Stanley, Bureau Chief.

## Advertising

Lloyd R. Vivian, formerly assistant advertising manager of Ditzler Color Co., Detroit, has been named sales promotion manager, and will have charge of all advertising and promotion work.

James P. Selvage, retiring public relations director of the National Association of Manufacturers, and Fred Smith, formerly public relations and publicity director of Batten, Barton, Durstine & Osborn, Inc., and J. Sterling Getchell, Inc., have formed a public relations firm.

Universal Battery Co. has placed its advertising campaign with Behel & Waldie, with Lee R. McCullough as the account executive.

Schwimmer & Scott, Chicago, has been named by Chrysler to handle used car advertising throughout the country.

# Just Among Ourselves

## A Prophet With Honor

**I**GOR SIKORSKY went to Syracuse Jan. 30 to address an S.A.E. section meeting. Other interests in town learned about it and before the arrangements were completed it was darned near a civic holiday. Nearly 700 people turned out for the "S.A.E. Meeting." Mr. Sikorsky is a prophet with honor in his own adopted country, and, having heard him, we're in favor of it. During the next three years, the expansion of aviation training for national defense, into the schools and colleges will result in fanning popular interest in aviation to a white heat. Men like Sikorsky and Glenn Martin will become household names. And on how firm a foundation? Both have back of them 20 years of intense concentration of doing a big job well, coupled with the vision which distinguishes pioneers. Both of them knew the days when to pilot an airplane was literally to sit on the wind, with a few sticks and wires to hold you in place. Both have been damned as visionaries, and both have lived to raise monuments in alloy steel to those same visions.

## Same Men On Same Jobs

**S**PEAKING of Syracuse calls to mind the Aircooled Engine Corp., which under the engineering guidance of Doman and Marks is continuing production for aircraft and trucks of modernized Franklin aircooled engines. On a recent visit to the plant I asked Mr. Marks whether many of the old Franklin employees were included in the plant personnel.

He replied that about a third of Aircooled's payroll was made up of former Franklin employees and that most of them were working on exactly the same type of operation for which they were responsible on the older Franklin engine.

## Craft Standards Meet Any Need

**N**OT long ago one of the top officials in the War Department expressed the opinion that the automotive industries would not furnish a very effective reservoir of personnel for building airplane parts, because automotive men were trained to different orders of precision and quality.

It's our view that this generalization is probably 50 per cent true. There are many

plants through the industry where a tradition of craftsmanship was encouraged as it was in the old Franklin plant, and men trained in this tradition could, we believe, build almost anything.

The tendency toward decentralization of automotive production, the rise of comparatively small plants in isolated communities, will tend to restore some of the pride of workmanship which fades when a man knows he is something like 1/80,000th of a productive unit.

So we believe an industrial decentralization program can be said to have economic, social, and military virtues, the last at least twofold, because of the additional strategic advantage.

## Another May Join The Fold

**J**UDGING by a speech made this week by Claude Klugh of the Pennsylvania Automotive Association to automobile dealers in Ohio, Ohio may be the next state to adopt compulsory safety inspection of motor vehicles. Mr. Klugh outlined for the Ohio dealers the pros and cons of the Pennsylvania system, which calls for inspections through licensed private service stations. Pennsylvania dealers in the light of a recent questionnaire are overwhelmingly in favor of continuing the inspection routine, and with the same sort of set up. In New Jersey, inspection stations are state-operated. Said Mr. Klugh: If, in Ohio, you can overcome the objections to state operation, by all means study what New Jersey is doing, for they're doing it well.

## Deterding Death Recalls Warning

**T**HE death this week of Sir Henri Deterding, Dutch Shell oil magnate, recalls to this writer Sir Henri's solemn warning of half a decade ago that Japan was a menace to the world trade of other countries, not only in textiles but in automobile and machinery markets. Our own interest in Japanese activity in this field was crystallized by publication of Sir Henri's opinions on the subject. In the ensuing years, we have been assiduous reporters of Japanese automotive events. Many people have wondered if this wasn't going pretty far afield for automotive news. Without having the slightest intention of being jingoistic about it, we feel that Japan is three thousand miles closer to some of our export markets than she was three years ago.

—HERBERT HOSKING.



# What Must Be Done About

THE array of Army and Navy talent at the SAE Annual Meeting was impressive. Maj.-Gen. Henry Gibbins, quartermaster general, discussed "Military Motor Vehicles—The Problems of the Quartermaster Corps"; Maj.-Gen. C. M. Wesson, chief of ordnance, reviewed current trends in the design of "Automotive Ordnance"; Maj.-Gen. H. H. Arnold, chief of Air Corps., spoke on "Performance and Development Trends in Military Aircraft and Accessories"; and Capt. John H. Towers, U. S. Navy, assistant chief of the Bureau of Aeronautics, presented his views of "Mutual Problems in Air Transportation—Military and Commercial." At the dinner climaxing the day's program, Gen. C. T. Harris, Jr., assistant to the chief of ordnance, chief of the industrial service, dealt comprehensively with the problem of "Industrial Mobilization for National Defense." Abstracts of these papers are presented herewith.

## *Brig. Gen. C. T. Harris, Jr., on mobilization*

Assistant to the Chief of Ordnance,  
Chief of the Industrial Service

AT this moment we are the strongest industrial nation in the world. We produce approximately one-half of the world's goods, and we consume approxi-

mately one-half of the world's raw materials. Why then, you may ask, should concern be given for the industrial effort in a war? The peacetime industry is geared to the pro-

duction of the peace-time needs, which are quite different from the war-time needs. Planning for war procurement involves four important questions which must be answered before plans for that item can be considered complete. In the usual order of occurrence these problems are:

1. What item is wanted? Answered by selecting a standard type, and making drawings and specifications available.

2. How much is wanted? Answered by computing requirements, due regard being given to combined (Army and Navy) needs.

3. Where can it be obtained? Answered by industrial surveys, resulting in allocation of production facilities suitable to the task.

4. How can it be obtained in the time and quantity desired? This can be answered only by a complete production plan for the particular item.





*Top flight civilians from the automotive, aircraft, and related industries listened to high-ranking officers from the U. S. Army and Navy present their suggestions and problems at the annual S.A.E. meeting in Detroit.*

## t National Defense—NOW?

with the assurance of the availability of proper contract forms and procedure.

Standardization of equipment is prescribed in specifications and drawings, all of which must be available before satisfactory plans can be made for procurement. The General Staff approves organization tables, equipment tables and allowance tables. The supply branches compute the supply requirements which are approved by the Secretary of War. The supply branches then convert these supply requirements into procurements, taking into account the existing war reserves and the time factors necessary to transport the completed articles from the factory to the supply channels of the army.

One of the recent major accomplishments of the War Department has been the promulgation of the Protective Mobilization Plan. It had become increasingly clear that

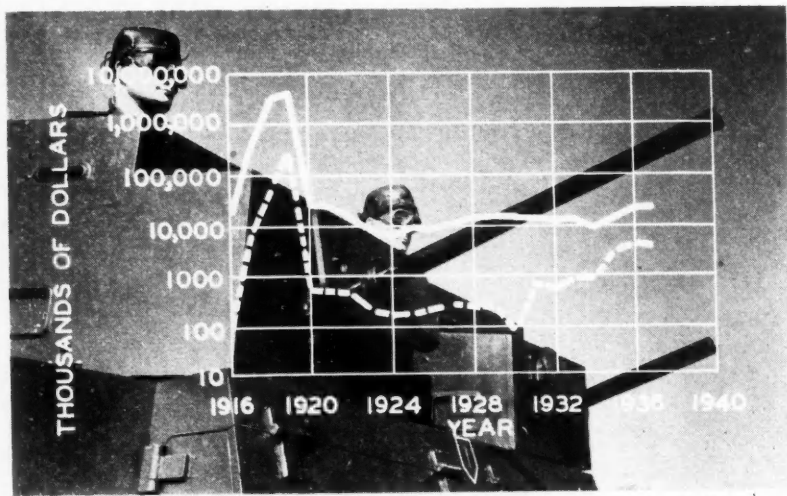
the provisions in the ambitious 1933 War Department Mobilization Plan, either in induction and processing of man power or in procurement and supply, could not be realized. Careful studies have demonstrated clearly that the procurement possibilities of the nation are inadequate to meet the production program required under this plan. As a result, the Protective Mobilization Plan was issued in March, 1938, by the War Department. This latter plan provides for the mobilization of a force of 1,000,000 men and is the basis for the Initial Military Program. Extension to a total force of four field armies and the necessary GHQ Reserve and Harbor Defense Troops is possible.

The mobilization of industry involves extensive "tooling up", conversion of production lines, and the training of skilled labor. It may require weeks, months, or, in some

cases, a year, to reach full production schedules. Planning for industrial mobilization is therefore a long range proposition and must be based upon the ultimate force to be mobilized. The Protective Mobilization Plan, with its subsequent development, forms an approximate procurement basis for the ultimate mobilization.

In a major emergency the War Department must depend upon private industry for at least 90 per cent of the munitions required. While the manufacturing arsenals and Government establishments are vital in our scheme of preparedness, they find their true role as experimental and testing laboratories to keep alive the art of munitions making, to get standards, and to train inspectors.

One of the basic questions to which reference has already been made is: Where can the items be



International Photo

Total ordnance and automotive expenditures for the U. S. Army in thousands of dollars for the years 1916 to 1937

procured in the time and quantities required? This question involves two main considerations:

First, it is necessary to determine the capacity of industry to produce.

Secondly, this capacity must be apportioned equitably among the procuring agencies, including the Navy. If there is not enough existing capacity (plants in being) suitable for the purpose to meet all essential needs, then plans are made for expansion or new construction.

This procedure, whereby the capacity is apportioned among the procuring agencies and definite plants or firms are assigned to them not only for planning but also for production in war time, is what we term allocation. It is well to note at this time that it is neither necessary nor desirable to allocate specific facilities to produce all of the requirements. Most of the material that is of a commercial nature can be procured in time in the usual manner under competitive bidding. It is desirable, of course, to obtain competition wherever it is practicable to do so. It is mainly for the technical items with no commercial counterpart, or where there is shortage in capacity and serious procurement problems will be encountered that allocation is made—for example, artillery, military aircraft, ammunition, bombs, fire control instruments and gas masks. In many cases such items must be procured by components made in different plants, sometimes widely separated.

It is necessary to allocate also for production of certain contributory materials to insure the production of munitions. Examples are machine tools and gages, without which mass

production would not be possible. For basic raw materials, however, like coal, iron ore, copper, and cotton, allocation is not made. Such materials are continually studied and plans made to pool these materials to insure that essential requirements are met.

The desirability of apportioning the capacity to the procuring agencies has been mentioned, but before we can do this, it is necessary to find out how much there is and where it is located. In other words, we have to contact industry. Plants must be studied and the management must be consulted. Obviously not all firms are suitable for making munitions, nor is it desirable for some to attempt it.

To make this survey of industry, each of the services responsible for actual procurement has divided the country into procurement districts. The number and boundaries of which have been set to meet its particular needs for planning in peace and for decentralized procurement in war. For example, the Ordnance Department has 14 districts, while the Corps of Engineers has six. In each district there is a skeletonized staff consisting of the district chief, usually a prominent business man residing in the locality, who may or may not be a Reserve officer; an executive assistant, who is a Regular officer of the branch concerned, and clerical personnel.

This district organization is maintained for two important reasons; first, to make detailed surveys of and allocations to each plant to be used, and, second, to form a nucleus for expansion in time of war.

The supply arms and services,

having determined their needs under the mobilization plans set up by the War Department, apportion requirements to their several districts. In doing this they attempt to spread the load as evenly over the country as practicable. Based upon the data which they have available or upon additional surveys if necessary, the districts search out the facilities best suited to do the job and submit requests through their branch chiefs to the Office of the Assistant Secretary of War for definite assignment of the plants.

After the plants are selected and the allocations have been approved, the requirements on each facility are finally submitted to the management on what is termed a schedule of production. Their signature of this schedule, while not legally binding on either the Government or the facility, indicates the willingness and ability of the firm to produce the items at the rates prescribed. Obviously the survey work is a continuing function. This is necessary because neither requirements nor resources can remain fixed.

Through the district set-up a large number of prospective facilities have been surveyed. Some 10,000 plants have been selected for allocation. The data on file in the Office of the Assistant Secretary of War for each allocated facility include such information as number and kind of employees, financial rating, normal products, capacity for production and exactly what it is to produce in case of an emergency.

This personal contact with industry through the district system is of the utmost importance. The selected plants are acquainted with the task to be accomplished through specifications, drawings, and other descriptions of the items to be manufactured. Actual samples are issued when appropriate to do so. Each facility actually becomes familiar with our requirements and our problems.

The development of standard forms of contract to cover not only commercial and non-commercial items of munitions, but also construction activities has received special attention. The policy is to follow peace-time forms as closely as war conditions will permit and to utilize fixed price contracts so far as practicable.

The War Department believes in a fair profit to industry, and that fair contract procedure, prevention of run-away markets and a sound excess tax law will largely remove profiteering.

We have in this country ample sources for our full requirements of food, coal, petroleum, iron ore, iron and steel, machinery, chemicals, copper, lead, nitrates, silver, cotton, zinc, and phosphates. No other nation can match this superb list of national resources. Even though we have so many essentials available there are some raw materials in which our domestic production will fall far short of supplying the national needs. There are some 21 of these so-called strategic materials, of which nine are minerals. Some of the outstanding raw materials for which we must depend upon foreign sources for our needs in either

peace or war are manganese, chromium, tungsten, nickel, tin, and rubber.

Industrial preparedness plans cannot be written today and safely tucked away until a national emergency arises. Plans of this kind would be worse than useless. But this much can be said in truth: Some of the best minds of industry, the professions and the defense services have collaborated for years in the development of our plans. Whatever shortcomings there may be in such studies, the fact remains that in time of emergency, plans for industrial preparedness are believed to be workable.

duction, nevertheless many modifications are desirable to secure a satisfactory military motor vehicle, and to neglect certain of them may seriously interfere with combat operations, particularly of front line troops.

The modifications of commercial vehicles that more or less seriously hamper production are those required essentially to secure vehicles satisfactory for cross country operations. The basic characteristics of such a vehicle, in addition to power, speed and ruggedness which generally can be secured from the industry are high angles of approach and departure, sufficient flotation and ground clearance and the maximum possible traction and grade ability.

Through improvement of design and refinement of materials, the commercial vehicle is now sufficiently rugged for requirements of the military service. Also, the industry has assisted in making possible the conversion of the standard two wheel drive vehicle into an all wheel drive type satisfactory for cross country operations, thus eliminating requirement for a special type. Further, this conversion has been made relatively simple and readily adaptable to mass production manufacture in an emergency, with, of

## Maj. Gen. Henry Gibbins, on motor vehicles

Quartermaster General

**R**EQUIREMENTS as to types of military motor vehicles may be broadly divided into four gross weight classifications, as follows:

*Extra Light Class* (gross weight less than 6000 lb., payload  $\frac{1}{2}$  to  $\frac{3}{4}$  ton)—These are command and reconnaissance vehicles of the passenger car and commercial carry-all classes, utility trucks, weapons and combat ammunition carrier and prime movers of light cannon such as the anti-tank gun. *Light Class* (gross weight 9000 to 10,000 lb., payload  $1\frac{1}{2}$  ton)—These are light cargo vehicles comprising combat and field trains, prime movers of light artillery, engineer dump trucks, light repair vehicles, etc. *Medium Class* (gross weight 13,000 to 15,000 lb., payload  $2\frac{1}{2}$  ton)—These are essentially prime cargo carriers and troop movement vehicles comprising rearmost supply and supporting transport. In this class we also have trucks for towing medium artillery, searchlight transport, certain types of repair trucks, etc. *Heavy Class* (gross weight approximately 30,000 lb., payload 5 to  $7\frac{1}{2}$  tons)—The requirements of these vehicles are relatively limited compared with the other classes and include prime movers of heavy field and anti-aircraft artillery. Air Corps field servicing trucks, etc.

It may be considered that the industry can meet our requirements in general purpose motor vehicles for operation in the combat zone but that some delay will be encountered in securing required types in the early months of a major emergency and the vehicles actually procured

will consist of a great variety of makes, lacking the payload capacities of the higher tonnage classifications needed and will be, initially at least, the standard commercial types with few, if any modifications.

While modifications of these vehicles to meet service requirements must be limited to those that can be made without unduly retarding pro-

COMMERCIAL STATUS OF ORDNANCE AUTOMOTIVE VEHICLES  
AND THEIR MAJOR COMPONENTS

ORDNANCE VEHICLES	Is the Vehicle as a Whole Commercial	Engine	Clutch	Transmission	Frame	Hull or Body	Axles	Wheels	Tires	Tracks	Instruments	Guns and Mounts
Light Tank M2	No	M	S	S		S		S	C	S	C	S
Scout Car M3	No	M	C	C	M	M	C	C	C		C	S
Light Tractor T3E4 (Spec. High Speed)	No	C	C	C	S	S		S		S	C	
Light Tractor M2	Yes	C	C	M	C	C		C		C	C	
Heavy Tractor M1	Yes	C	C	M	C	C		C		C	C	
Half Track Truck T9	No	C	C	C	C	M	C	C	C	C	C	S
Bomb Trailer T14	Yes				C		C	C	C			
Crane, Track Laying, Medium T1	Yes	C	C	C	C	C	C			C	C	
Truck, Machine Shop	Yes	C	C	C	C	M	C	C	C		C	
4.2-in. Mortar Motor Carriage T5E1	No	M	C	C	M	M	C	C	C		C	S

C = Standard Commercial Component.  
M = Modified Commercial Component.  
S = Non Commercial Component (Special).



course, some delay for adjustment. And finally, by use of a third driving axle or rear bogie arrangement it is possible to convert the light gross weight chassis ( $1\frac{1}{2}$ -ton payload) into a  $2\frac{1}{2}$ -ton payload vehicle which has excellent promise of being satisfactory as our prime cargo carrier and troop movement vehicle of the medium class. This latter development will allow a single basic chassis to be used for our combat zone requirements in both light and the major portion of medium weight vehicles, thus providing for this particular purpose a method of highly standardizing chassis requirements in these two very important weight classifications.

However, in these connections, there are two problems still with us. One is that of securing in peace time such converted vehicles at a cost price that will allow us within our limited funds to motorize our Army with needed all wheel drive types; the other of providing these vehicles in the quantity required to meet our war needs, without unduly delaying production. Our immediate urgent need is for four wheel drive  $\frac{1}{2}$  to  $1\frac{1}{2}$ -ton payload capacity vehicles costing less than \$1,000. The same urgent need will exist in war, but production rather than cost price will then be the problem.

The third main consideration offered in substantiating the requirement of a special type of vehicle for military purposes was, as previously stated, the difficulties of maintenance of commercial types due to multiplicity of makes and models.

There are approximately 23,000 general purpose motor vehicles in the Army consisting of 30 makes and models of passenger cars and 148 makes and models of trucks. The

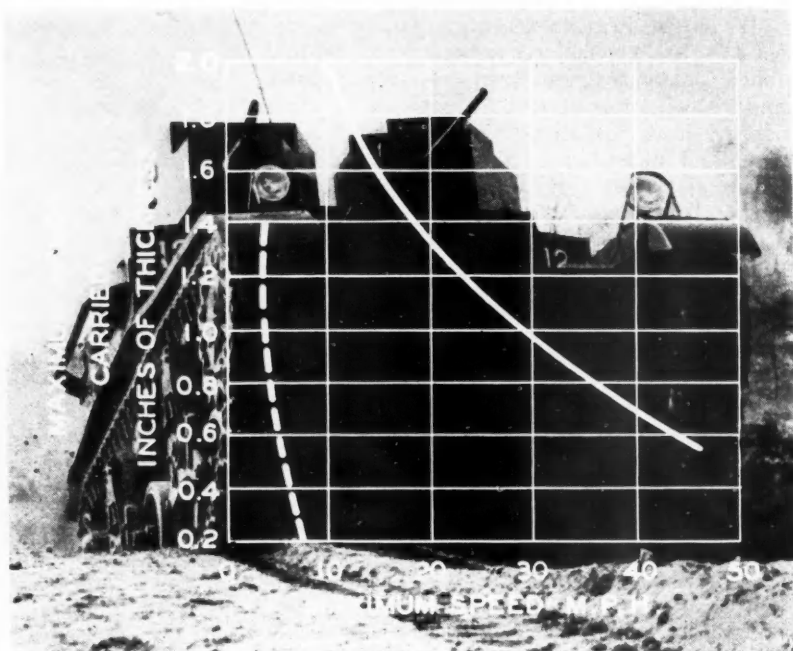
trucks include payload capacities ranging from  $\frac{1}{2}$  to  $7\frac{1}{2}$ -tons and 2-wheel, 4-wheel and 6-wheel drive units. This situation presents a difficult and expensive maintenance problem in peace time and one impossible of satisfactory solution in war. While restrictive laws governing purchases and limited appropriations will not be factors in war procurement, nevertheless, if the capacity of the industry to produce commercial vehicles, is depended upon to furnish our requirements, without careful attention to standardization, this peace time situation may be continued on a similar scale in a major war.

## Maj. Gen. C. M. Wesson, on ordnance

Chief of Ordnance

THE outstanding development incorporated in the modern light tank is the radial, air-cooled, aviation-type gasoline engine of 260 hp., which with its accessories weighs only about 600 lb., or 3 per cent of the tank. The use of such an engine in a tank was initiated by the Ordnance Department in 1930 amid considerable misgivings on the part of the industry. It has by now been developed to the stage that the engine is cooled very economically and gives most satisfactory and reliable service, giving

our tanks thus a power/weight ratio well ahead of any foreign machines. The use of very light high power engines is essential to obtain the performance demanded by our Infantry and Cavalry. Another important development which makes this tank possible is the use of rubber, particularly in the tracks. These tracks consist of fabricated steel links encased in solid rubber of a special composition, which is vulcanized to the links. These rubber track blocks are assembled into an articulated track by the use of rubber-bushed



Acme Photo

Armor versus speed in fighting tanks showing the improvements since the World War. The dotted line shows the record of 1918 while the solid line shows the record of modern tanks from 1930 to 1937

steel hinge pins in such a way that all relative motion of one block to another is by torsion in the rubber bushing. There are no steel pins to wear out, and the tank rides wholly on and is propelled through rubber as is a solid-tired truck. At its present stage of development this type of track has approximately one-half the resistance to traction of an all steel track and about twice the mileage life under comparable conditions of speed.

The engine power is transmitted through a five-speed constant-mesh transmission to a controlled differential; steering is accomplished by two steering levers, operating each a brake on one side of the controlled differential so that turning is effected by slowing down the track on the side to which it is desired to turn. A smooth turn of any radius down to about 17 ft. may be made. It is also worth noting that this tank has no chassis or frame; the hull or body is constructed of armor plate and the suspension and other components are fastened directly to the hull. This design is used to save weight, which is important as armor plate weighs 40 lb. per sq. ft., 1-in. thick. Weight is thus the constant enemy of the tank designer. It takes armor about  $\frac{1}{2}$  in. thick to keep out all sort of rifle and light machine gun bullets at all ranges. While our latest armor plate specifications are confidential, I may say that considerable progress has been and is

still being made in the improvement of armor plate.

The outstanding development in foreign armies is the building of much heavier (but also slower) tanks than we now use; tanks of about 30 tons may be said to be fairly common and a number weighing over 100 tons have been built. Such heavy machines use gas-electric drive. The general tendency in all armies, primarily as a result of experience in the current undeclared wars, is toward heavier armor and a diversification and specialization of tactical types, as is already the case with airplanes and naval vessels. Generally speaking, the tank may be said to have passed the pioneering stage technically and to be entering the stage of refinement of the design to meet the changing tactical demands developed in the current wars and peace maneuvers, and to reduce its cost of operation.

Our principal requirements are in tanks, scout cars, half-track trucks

and tractors for hauling artillery. We have plans to procure this equipment from a number of suitable firms in the automotive industry. Of the four classes mentioned the tank represents by far the greatest problem in procurement, with estimates ranging from five months to one year for production after M-day. Predicated on experience both in the World War and in peace, I am inclined to favor the higher estimates. The choke item in the production of tanks will undoubtedly be the armor plate, which requires very special knowledge and equipment to produce. As to our quantity requirements, while I cannot reveal these, they will be large, as you may judge, since we ordered for our American Expeditionary Force in 1918 over 22,000 tanks and 25,000 tractors. Stephen Possony in "Tomorrow's War" estimates 280,000 tanks and other armored vehicles required for a modern mechanized army in a year of a major war.

with the Flying Fortress on more equal terms.

During the past year we have had very actively in operation our own substratosphere plane, the XC-35, which has served as a high altitude laboratory. Our success with it indicates the early probability that giant bombers will house their personnel in sealed pressure cabins and that they will be designed and equipped to fly in altitudes in excess of 30,000 ft.

The great increase in size and speed of air vessels has led to tremendous changes in the dimensions and types of airdromes. There is now a general feeling that we must concentrate on a reduction in airdrome requirements by building into our planes slower landing speeds.

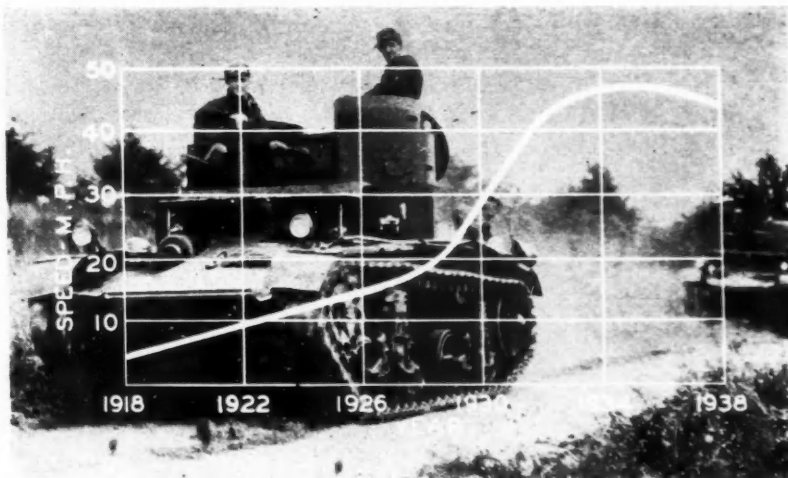
It is possible that during the next five years the airplane may take on an appearance considerably different, at least superficially, from its present form. Basically, the wing-body components will probably change but little as they are molded by inflexible laws governing the contours, designed to pass readily through a fluid medium. But in general arrangement, several recent developments—or more properly speaking, revivals of old ideas—have begun to exert quite a large and disturbing influence. The first is the reincarnation of the nose wheel,

## Maj. Gen. H. H. Arnold, on aircraft

Chief of Air Corps

HERE are some recent trends in fighting airplane and accessory development. It appears that no plane can be considered for future development which will not have a speed in excess of 400 m.p.h., and our engineers are talking quite seriously of 500 m.p.h. as a practical possibility. They propose to reach these speeds possibly in two ways. First, in what is called a "clean up of design," as the engineers say, they are going to bring everything indoors and lock the door; nothing will be left projecting or hanging outside. The other method is by a tremendous increase in the horsepower of the motive powerplant. There are other accessories and adjuncts which will play vital parts, such as propellers and fuels. The definite trend for the fighter is for a smaller and lighter airplane. It will be small and as light as possible, bearing in mind that it must house a powerplant of some 2000-4000 hp., and there must be a gun platform, probably for a single small cannon of at least 37 mm. caliber. It will have but a single occupant as the pilot will also serve the gun which will be electrically operated and controlled. There is but one slight variation from this mighty little atom of a fighter which I have just described and that

may be the advent of the multi-seater fighter. There has been considerable feeling of late that the



This graph shows the development in the maximum speeds of tanks from 1918 to 1938

modern air war is going to require a plane of the fighter type which can carry more armament, perhaps two cannons and from two to four machine guns of 30-50 caliber, in order that it may engage in combat

the same in principle as the one used in 1908. The second revival is still some distance off, but it is yet a more radical change; that is, the "tail-first arrangement." This consists in locating the horizontal tail



surfaces ahead of the wing and thus utilizing all of the tail surfaces in a lifting effort. It goes without saying that we must improve our aerodynamic cleanness of design and this entails smooth contours, low drag power units, thin wings, completely retractable landing gear, no interference, the absolute minimum of cooling drag, and the general absence of all bumps such as exposed rivets, lap joints, tail wheels, exhaust stacks, air intakes, aeri-als, and a host of other parasites. A smooth finish is requisite to reduced skin friction drag and all openings must be carefully sealed to prevent leaks and subsequent interference losses. Crew accommodations and arrangement must be reduced to the minimum dimensions consistent with efficient fulfillment of the military mission.

### Engines

No matter how aerodynamically clean aircraft may become in the near future, cruising speeds of 300 m.p.h. and above for bombardment aircraft, and high speeds of between 450 and 500 m.p.h. for pursuit planes

in the individual cylinder, the problem becomes one of grouping a multiple number of cylinders in an arrangement that creates the minimum amount of aerodynamic drag. As airplanes grow larger we undoubtedly shall bury the engines completely within the wing.

Engine development and fuel development have progressed hand in hand. The improvement in anti-knock value of fuels has been largely utilized by present aircraft engines in obtaining increased power output. In this connection the engine of today burns its own weight of fuel in a four-hour flight at cruising speed. For long range airplanes one can readily see where low specific fuel consumption will become more important than specific weight of engine.

The long range airplane will be of little value unless its powerplants are able to function for long periods of time under minimum fuel consumption conditions. Such engines must be designed for extreme reliability and durability far in excess of anything available today. It is quite probable that both the aircraft

nautical features and accessories and that there must be early stimulation of engine development to provide us the airplanes we require.

### Structures

Since the aluminum industry may be seriously handicapped in supplying all the needs of the aircraft industry in the event of a major emergency, the Air Corps is now investigating the manufacture of airplanes made of materials other than aluminum. Bakelite propellers and pulleys have been known for years and instrument boards and cases are now being satisfactorily molded. There is the possibility of molding wing spars and ribs and fuselages from thermosetting plastics reinforced by wood and wire. The industry can be expected to investigate this possibility fully in the very near future, with what may perhaps be startling results.

We are today flying a small quantity of spot-welded stainless steel wings and predict that the use of spot-welded stainless steel is on the up grade. Perhaps we shall make a complete airplane out of stainless steel eventually.

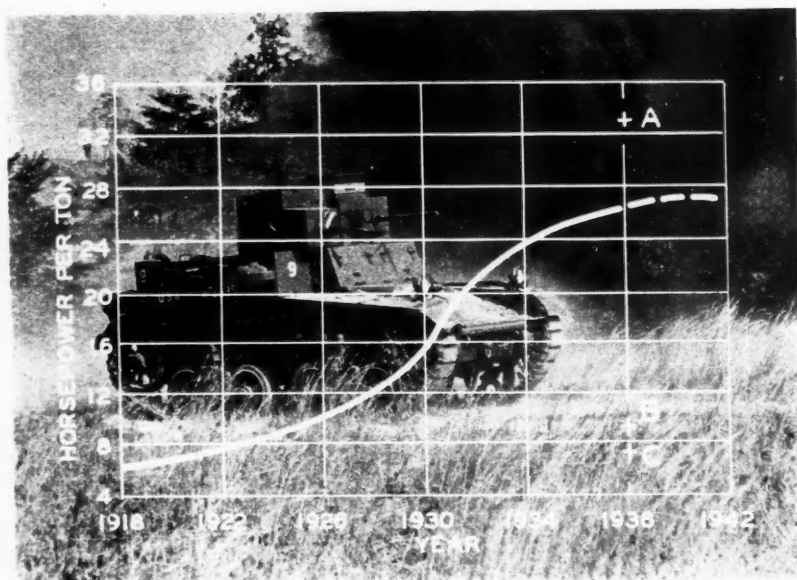
The spot welding of aluminum alloy is also on the increase and may within a few years take the place of flush rivets on exposed surfaces. The Air Corps has one pair of aluminum wings flying today which are entirely spot welded.

### Materials

The modern airplane requires materials having a high strength-to-weight ratio. Other factors, such as fatigue strength, yield strength, notch sensitivity, ductility, impact strength and corrosion resistance, are of importance and must be considered in designing airplane parts.

At the present time aluminum alloys constitute between 75 and 85 per cent of the structural weight of many military airplanes and approximately 50 per cent of the weight of the engine. There is room for improvement in the ability of these alloys to resist fatigue. Forging alloys of aluminum have a fatigue strength of only 25 per cent of their ultimate, whereas in the forging alloys of steel the fatigue strength approaches 50 per cent of the ultimate.

Recent developments of an alloy of magnesium-aluminum-zinc and manganese have improved the resistance to corrosion. It appears that other metallurgical improvements may extend the application of magnesium in aircraft construction.



Increase of gross horsepower per ton of gross weight of tanks from 1918 to 1938 and extended to 1942. The points A, B and C show the average hp./ton ratios for late models of passenger cars (A), commercial trucks (B) and commercial tractors (C)

will mean great increase of horsepower with a considerable step-up in the unit size of engines. Motors of from 3000-4000 hp. no doubt will be built.

Since in all probability, we have already attained the maximum size

structure and the propeller will have to be insulated against the abnormally severe vibrations that breed in the engine.

It appears to me that engine development at the present time is lagging behind many other aero-



The heat-treated low-alloy steels are standard materials for highly stressed airplane and engine parts. The use of SAE-4140 and 4340 steel is increasing because of their good forging properties and their ability to develop high and uniform properties in relatively heavy sections after oil quenching. There is need for a steel which will have a tensile strength of 250,000 to 300,000 lb. per sq. in., together with reasonable ductility, impact strength and a fatigue strength of half its ultimate. Such a steel has not yet appeared.

The development of austenitic steels and the nickel-chromium-iron alloys, as well as the nickel-molybdenum-iron alloys, will probably continue in an effort to get a more suitable material for exhaust stacks. We are looking for something which will resist corrosion and scaling and yet have a high strength at elevated temperatures.

The use of paint-type coatings on the exterior surfaces of metal covered airplanes will probably decrease.

The replacement of rubber material, which is a strategic material, with rubber-like synthetics is being rapidly accomplished. Synthetic hose for fuel, oil and prestone lines has proved superior to the rubber hose, and the use of synthetics is rapidly extending to tires, tubes, and balloon fabrics.

We expect in the near future to fabricate our parachutes out of a man-made material which promises in every respect to exceed the performance and properties of the fiber made by the silkworm.

The prospects of all this horsepower, together with the planned increase in high altitude flying, will require a considerable acceleration in propeller development.

### Propellers

The solution of propellers for the smaller airplanes will probably be found in the design of propeller having four and finally six blades of relatively small diameter mounted either in a single hub or divided equally between two hubs which revolve in opposite directions about the same center of rotation.

The solution of propellers for the larger airplanes will be found in the development of propellers of three, or possibly four, blades having a diameter upward of 20 feet. The primary design problem here necessitates the satisfactory development of blades much lighter in weight than present types. Hollow

steel, hollow dural, magnesium, and plastically impregnated wood all seem to be possibilities.

Because of the high efficiency and flexibility of operation of the controllable propeller as it exists today, it will be many years before any other means of propulsion, such as rocket or jet propulsion, can be expected on a large scale.

### Automatic Landing

The first completely automatic landing to be made anywhere in the world was accomplished at Wright Field at our Experimental Division

in August, 1937. Many have been made since then. Although the present equipment has not reached that stage of development that enables us to use it on production airplanes, we hope to service test a small quantity before long. Our engineers who developed the automatic landing device were awarded the Mackay Trophy last September for the outstanding military flight of the year. When completely developed, this apparatus presages the time when conditions of more visibility will be no limiting factor to the operation of the airplane, either civil or military.

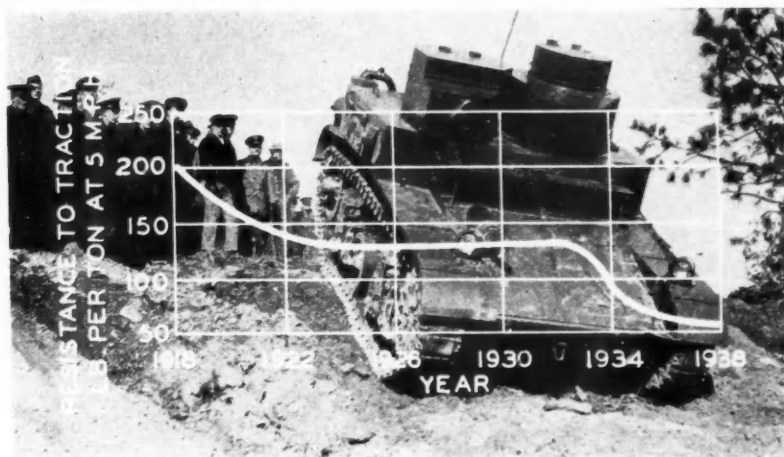
## Capt. John H. Towers, on air transportation

Asst. Chief of the Bureau of Aeronautics

THE technical progress in aircraft design in the last 20 years has not been a smooth upward curve, nor is it ever likely to be so. It proceeds by a series of irregular leaps to a higher level, as each new discovery is digested and consolidated into construction of actual airplanes, and flattens out until an industry or a service demands increased performance, and the overworked technician is forced to provide it. Dr. Warner, to whom I acknowledge my indebtedness, in one of his James Jackson Cabot Professorship lectures at Norwich University, lists four major advances to higher ground in the two decades since the World War.

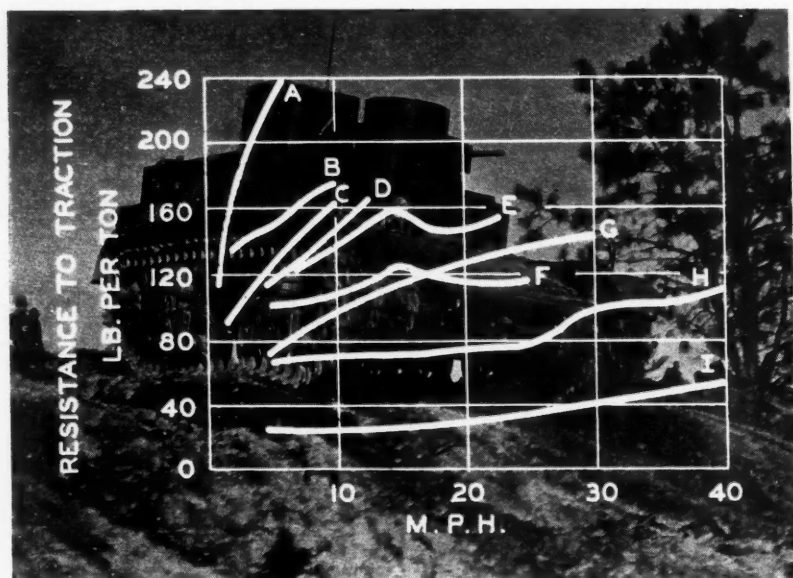
The first of the four is the recognition of the importance of wing-loading, which in the period under

observation has increased from 7 or 8 lb. per sq. ft. to 28 lb. per sq. ft. of wing area. The augmented payload made possible by increased wing-loading or by its equivalent, reduction of wing-area, was a welcome gain, but it brought with it longer take-off runs, a poorer rate of climb and a lowered ceiling. A more direct limitation was the maximum allowable landing-speed, imposed in the case of commercial operators by government regulation; in the case of the naval service, by the capacities of carrier arresting gear; in both, by the skill of their pilots. The operator has been torn between the wishes of the designers to raise wing-loading to higher figures in order to give him improved performance and greater useful loads, and his own concern.



International Photo

General reduction in resistance to traction or power consumption in tanks from 1918 to 1934 with steel track pins and from 1934 to 1938 with rubber bushed track pins. These data are from traction dynamometer tests at the Aberdeen Proving Ground



Aerme Photo

This graph shows the resistance to traction of full track versus wheeled vehicles

- A—Old type commercial tractor with steel tracks.
- B—Old type light tank with steel tracks.
- C—Old type medium tank with steel tracks.
- D—New type commercial tractor with steel tracks.
- E—New type commercial tractor with rubber band tracks.
- F—Ordnance special tractor with ordnance rubber block tracks.
- G—Ordnance special tractor with ordnance rubber block tracks.
- H—Ordnance new light tank with ordnance rubber block tracks.
- I—Ordnance scout car with pneumatic tired wheels.

sternly reinforced by the Civil Air Regulations, for the greater safety inherent in reduced landing speeds. The Bureau of Aeronautics has been forced to a conservative attitude in this matter by the energy-absorbing capacities of its carrier arresting-gear in the case of landplanes, and by the ability of their hulls to withstand high landing-speeds in rough water in the case of its flying boats. Yet, no more than the commercial operator can the Navy forego the advantages of higher wing-loading, and it has been forced to undertake extensive alterations of its ship-board installations in order to purchase them.

The second major development in design is the development of multi-engined airplanes. The military services, in the days before civil air transport, developed the twin-engined bomber because there were no single engines of sufficient power to carry the loads which they wanted to carry; they gained as a consequence better pilot-and-bomber vision, and provided the forward gunner with a greatly-enlarged field of fire. The transport industry demanded the multi-engined airplane for increased safety and the roominess of its greater size. The two

groups were supplied by the technician with airplanes which, except superficially, are identical, but again they found that though they had gained their ever-receding goal, it was at the cost of once again solving a host of attendant problems. The increased unit wheel loadings made surfaced runways imperative, the increased size of airplanes made existing hangars and shop structures inadequate in size, synchronization of engine speeds to avoid troubles once vibrations became necessary. Pilot technique required improvement to cope with increased speeds and decreased maneuverability. The Navy has been reluctant to adopt multi-engine design for its carrier aircraft, feeling that the burden of multi-engine operation would break the back of that harassed camel, the pilot, and that the span-wise limit of size had already been reached. But the quest for increased performance will not be denied for long, and the Air Corps has already produced a twin-engine pursuit as a harbinger of the fighting planes of the future. In the flying boat field military and commercial types employing four engines are in production. The curve should flatten here, so far as increasing the number of power units is

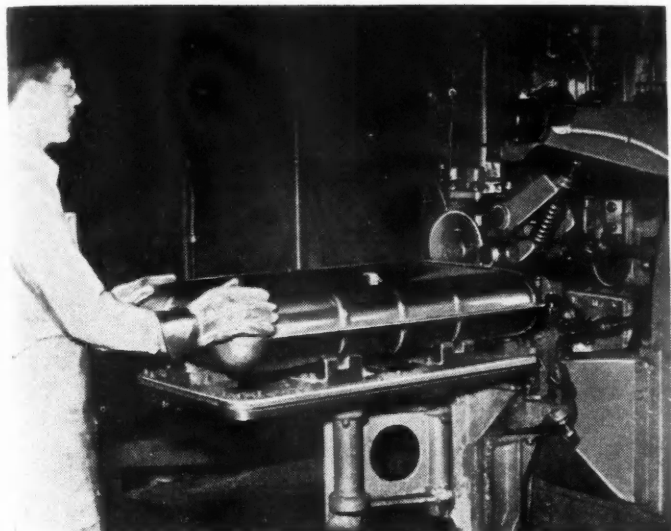
concerned, and increased performance awaits engines of greater horsepower.

The full scale wind-tunnel experiments, undertaken in 1927 at the National Advisory Committee's Langley Memorial Laboratory, culminated in the following year in the third advance in airplane design, the NACA cowl. Its further development, together with the location of the engine nacelle in the leading edge of the wing, and the subsequent placing of engines on the line of the wing chord, bore fruit in a reduction of 15 to 25 per cent in the total drag of the typical airplane at maximum speed. The application of the cowl-ing to high-power engines presented a difficult problem, but it was solved in brilliant fashion by the industry, which evolved the fully baffled engine of today, and concurrently produced the deep-finning of modern air-cooled engine cylinders. The development of the variable-opening annulus at the rear of the cowl was a consequence of this research, adding the last refinement to a great contribution to applied aerodynamics.

The fourth and last improvement in airplane design has given us the airplane as a single and self-contained structure, the stressed-skin, cantilever-bracing, and the advent of all-metal airplanes, mark the final advance of the twenty years we have been reviewing. A generation of skilled wood-workers passed from the scene, or hastily acquired new skills in forming and fastening metals. Dislocations of both industry and services were severe, for the transition was rapid, and perhaps too hasty. The many advantages in wood construction and protective treatments, notably impregnation with thermoplastics, may yet bring it back into the field of medium-sized aircraft. It is a matter of interest that research into the uses of wood in aircraft construction is again active under the forced rearmament here and abroad. But the stressed-skin metal airplane dominates the domestic and foreign market, and it is a product to which American research agencies, American designers and American mechanics have made the heaviest contributions.

The most notable contribution to operating problems and the most significant factor in reduced operating costs has been the progressive improvement in airplane fuels. Fuel octane numbers have been raised to 80, to 87, to 87 without the addition

(Turn to page 170, please)



The fuel tanks of the 1939 Dodge Luxury Liners are made by welding two pressed steel halves through a single seam on specially designed machines

## Production Lines

cut across many responsibilities in many unexpected places. How many people, how many departments vary with the problem, but you may be sure that a sizable group of people pass on any important project or idea. Certain it is that in any forward-looking organization an idea that has merit will get a hearing. It will enter through the medium of some logical contact. But from that point on, the decision rests with some committee or group who have an interest. Whether you have a part or technical process or machine, make sure that you present every possible phase of the story so as to anticipate the questions of people you may never reach personally.

### Mind vs. Matter

Annual edition of the Panorama of Lubrication from the facile pen of the Editors of Shell Petroleum Corp., has come to our desk. This issue is devoted to the fundamentals of automotive engine lubrication, and quite an unusual presentation of the matter, interspersed with humorous jottings and sketches that relieve a message of serious import. The gist of the approach to the problems of the engineer, the sales and service man, and the user, is on the basis of the motor, the oil, and the human, and how this tangled skein may be unraveled through enlightenment on matters of lubrication. The subject is much too involved for even sketchy analysis here, for the book itself runs some 52 pages. But we commend it as more than light reading to anyone concerned with the design and operation of motor vehicles.

### Rust Preventive

A handsome booklet on the always important subject of rust protection has just appeared on Parkerizing. Although the process is familiar to many of our readers, the booklet is important if for no other reason than its clear exposition of the advantages of the process; as well as for the compilation of current applications. Both the steps the process and the research organization behind it are

described briefly. Finally there is an interesting section appraising the advertising and selling end of your business of the virtues and attributes of the process in enhancing consumer satisfaction.

### Rubber Specs

One of the important producers of mechanical rubber bushings for passenger car and truck chasses has some pretty constructive ideas as to rubber specifications in the interest of quality control and economy. He intimated that certain specs now in use are practically meaningless while other basic criteria are just waiting an opportunity to demonstrate their worth. Here is something that may well stimulate a standardization project within the SAE.

### Who Buys?

One of our good friends—a well-known motor car master mechanic—observed with much concern that many suppliers and equipment builders, among them being some seasoned representatives, fail to appreciate the complexity of buying influences in an automotive plant. For instance, there is no ONE individual who may be said to have sole responsibility for specifying any given item of equipment. In this era of specialization and co-operative action, the buying influences

### Handbook

Following our recent comment on new handbooks for your desk, we have received a handsome, leather bound volume on Republic Alloy Steels. It supersedes the last (1935) edition which was titled Agathon Alloy Steels. The new volume has been increased in size as well as scope. It includes for the first time many features which should prove valuable to metallurgists and engineers as well as students. A sizable section is devoted to definitions of modern metallurgical terms, rounding out an important contribution to the literature.

### Alky Combination

We are told that the latest thing in carburetor novelties is a device that operates on gasoline, then automatically switches to alcohol under certain operating conditions particularly at wide open throttle. We understand that the device is really a combination of two carburetors controlled by manifold depression linkage.—J. G.



# Moments of Inertia of Annular Bodies

By WILLIAM SAMUELS\*

**F**REQUENTLY an engineering problem is made difficult, not so much by its intrinsic complexity as by the lack of basic information needed for its solution. Let us take the problem of damping torsional vibrations of a crankshaft by a so-called harmonic balancer. Sufficient theoretical and empirical knowledge is available to determine the inertia needed for the small slipping flywheel of the harmonic balancer. But just how much inertia (short for moment of inertia) does that little balancer flywheel possess that has been designed, tentatively, on the board? It must be kept in mind that the results vary greatly with changes in the moment of inertia of this small balancer wheel. Consequently, rough approximations, while they may have been entirely satisfactory for large steam-engine flywheels and permissible for medium-sized automobile flywheels, are inadequate in the case of our small balancer wheel. This is so not only because the action of the damper is more sensitive to changes in the moment of inertia, but also because the relative error of the customary approximations increases greatly with decrease in the radial dimensions of the wheel.

In determining the moment of inertia of a wheel it is advisable, in all but the simplest cases, to divide the wheel section from the axis to the rim into a number of simple geometrical areas (the fewer the better), calculate the inertias of the rings represented by these sections, and then find the inertia of the whole wheel by adding up the inertias of the individual rings.

If now we consult tables giving

\* Project Engineer, Chevrolet Motor Division.

moments of inertia of various bodies, we find listed in them two ring bodies, a ring of rectangular section and a ring of circular section. Not even such a fundamental ring section as the triangle is considered.

In view of this dearth of essential information it was decided to investigate the moment of inertia of

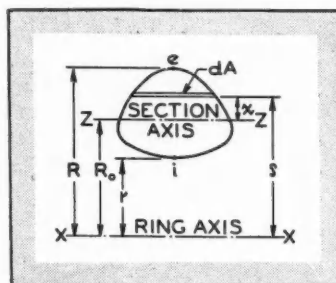


Figure 1

ring bodies in general, with the expectation that a common theorem for ring inertias could be found. This expectation proved to be correct.

The following deductions refer to Fig. 1. The section axis  $Z-Z$  passes through the section centroid and is drawn parallel to the ring axis  $X-X$  at a radial distance  $R_o$  from  $X-X$ .  $R_o$  may be termed the centroid radius.  $R$  is the outer and  $r$  the inner radius. An infinitesimal area  $dA$  is drawn parallel to  $X-X$  at a radial distance  $\rho$  from  $X-X$  and at a radial distance  $x$  from  $Z-Z$ . The exterior and interior points  $e$  and  $i$  are shown on the periphery of the section,  $e$  referring to radius  $R$  and  $i$  to radius  $r$ . Between these points  $e$  and  $i$  the integration has to take place. We then have—

Ring Inertia

$$I = \int dA \, 2\rho\pi \rho^2 = \int 2\pi dA \rho^3$$

$$\begin{aligned} I &= \int 2\pi dA (R_o + x)^3 \\ &= \int 2\pi dA (R_o^3 + 3R_o^2x + 3R_o x^2 + x^3) \\ I &= \int 2\pi dA R_o^3 + \int 6\pi dA R_o^2x \\ &\quad + \int 6\pi dA R_o x^2 + \int 2\pi dA x^3 \dots (1) \end{aligned}$$

In this equation the first term, which will be designated by  $I_b$  (bulk inertia) equals  $VR_o^3$ , where  $V$  represents the volume of the ring of total section area  $A$ . The ring volume

$$V = 2R_o \pi A, \dots (2)$$

and the bulk inertia

$$I_b = VR_o^3 \dots (3)$$

The second term of equation (1) may also be written in the form

$$6\pi R_o^2 \int dAx$$

As the distance  $x$  refers to the centroid axis ( $Z-Z$ ) of the section,

$\int dAx$  is equal to zero. Hence the

second term equals zero. This reduces the inertia expression to

$$I = VR_o^3 + 6\pi R_o \int dAx^2 + 2\pi \int dAx^3$$

which may be written in the form

$$I = VR_o^3 + 6\pi R_o \int dAx^2 + \text{Third Term} \quad (4)$$

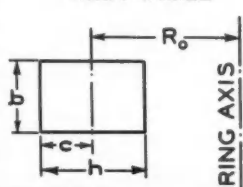
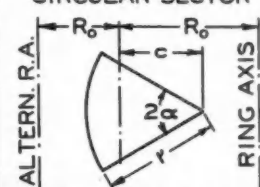
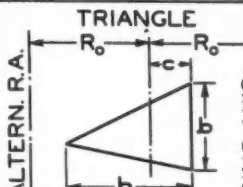
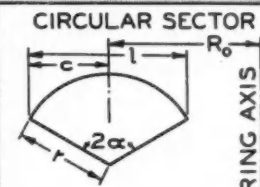
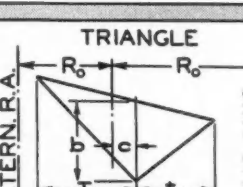
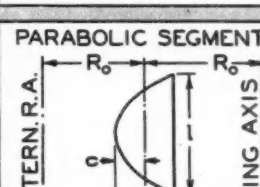
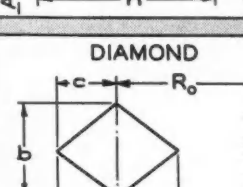
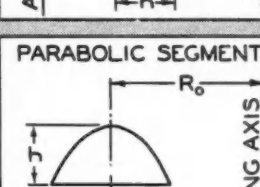
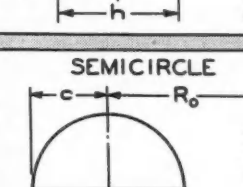
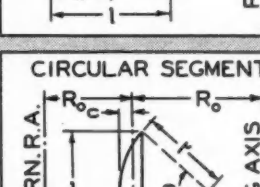
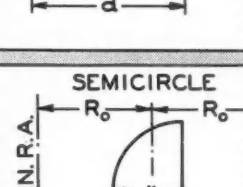
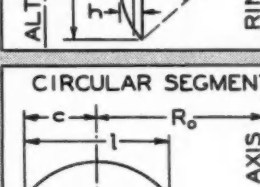
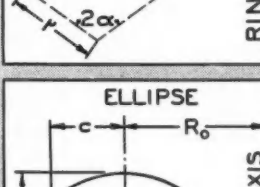
The third term,

$$2\pi \int dAx^3$$

is equal to zero for all sections symmetrical about the centroid axis  $Z-Z$  of the section, as for each positive product  $dAx^3$  there is an equal negative product  $dAx^3$ . It will be shown later on by a numerical calculation in connection with such

## MOMENTS OF INERTIA OF RING BODIES

IN ALL CASES VOLUME  $V=2R_o\pi A$ 

SECTION	SECTIONAL AREA A CENTROID DISTANCE C MOMENT OF INERTIA I	SECTION	SECTIONAL AREA A CENTROID DISTANCE C MOMENT OF INERTIA I
 <p>RECTANGLE</p>	$A = bh$ $c = \frac{b}{2}$ $I = V(R_o^2 + \frac{b^2}{4})$	 <p>CIRCULAR SECTOR</p>	$A = r^2\alpha$ $c = \frac{2r \sin \alpha}{3\alpha}$ $I = V(R_o^2 + nr^2)$ $n = \frac{3}{4} + \frac{3 \sin \alpha \cos \alpha}{4\alpha} - \frac{4 \sin^2 \alpha}{3\alpha^2}$
 <p>TRIANGLE</p>	$A = \frac{1}{2}bh$ $c = \frac{b}{3}$ $I = V(R_o^2 + \frac{b^2}{6})$	 <p>CIRCULAR SECTOR</p>	$A = r^2\alpha$ $c = \frac{r}{2}$ $I = V(R_o^2 + nr^2)$ $n = \frac{3}{4} - \frac{3 \sin \alpha \cos \alpha}{4\alpha}$
 <p>TRIANGLE</p>	$A = \frac{1}{2}bh$ $c = \frac{T-t}{3}$ $I = V(R_o^2 + nh^2)$ $n = \frac{1-t+t^2}{6}$	 <p>PARABOLIC SEGMENT</p>	$A = \frac{2}{3}bh$ $c = \frac{b}{6}$ $I = V(R_o^2 + 0.2057h^2)$
 <p>DIAMOND</p>	$A = \frac{1}{2}bh$ $c = \frac{b}{2}$ $I = V(R_o^2 + \frac{b^2}{6})$	 <p>PARABOLIC SEGMENT</p>	$A = \frac{2}{3}bh$ $c = \frac{b}{6}$ $I = V(R_o^2 + 0.151^2)$
 <p>SEMICIRCLE</p>	$A = \frac{d^2\pi}{8}$ $c = \frac{d}{4}$ $I = V(R_o^2 + \frac{3}{16}d^2)$	 <p>CIRCULAR SEGMENT</p>	$A = \frac{1}{2}r^2(2\alpha - \sin 2\alpha)$ $c = r - \frac{1}{12\alpha}$ $I = V(R_o^2 + 0.2057h^2)^*$
 <p>SEMICIRCLE</p>	$A = \frac{r^2\pi}{2}$ $c = 0.424r$ $I = V(R_o^2 + 0.2097r^2)$	 <p>CIRCULAR SEGMENT</p>	$A = \frac{1}{2}r^2(2\alpha - \sin 2\alpha)$ $c = \frac{r}{2}$ $I = V(R_o^2 + 0.151^2)^*$
<p>* NOTE: THESE I-FORMULAE ARE APPROXIMATED FROM THE PARABOLIC SEGMENT I-FORMULAE. ANGLES PROPER (<math>\alpha</math>) IN RADIAN.</p>		 <p>ELLIPSE</p>	$A = ab\pi$ $c = a$ $I = V(R_o^2 + \frac{3}{4}a^2)$ $2a$ (L.R.A.) MAY BE MINOR AXIS.

highly unsymmetrical sections as those of triangles that the "third term" inertia is negligible in all engineering problems. Hence we may write

$$I = VR_o^2 + 6\pi R_o \int_i dAx^2 \dots \dots \dots (5)$$

Now the integral  $\int_i dAx^2$  is the well-known section moment of inertia about the centroid axis or neutral axis of the section. It is the moment of inertia which we are using constantly in connection with beam-strength and similar problems. Hence we may write equation (6) in the form

$$I = \text{Bulk Inertia} + 6\pi R_o \times \text{Section Inertia} \dots \dots (5a)$$

$$I = I_B + 6\pi R_o I_{SA}$$

Or

$$I = \text{Bulk Inertia} + \text{Applied Section Inertia} \dots \dots (5b)$$

$$I = I_B + I_{SA}$$

with the understanding that  $I_B = VR_o^2$  and  $I_{SA} = 6\pi R_o I_{SA}$ .

The values of the bulk inertia  $I_B$  and of the applied section inertia  $I_{SA}$  are always positive.  $I_{SA}$  involves an important distinction which may be explained with the aid of Fig. 2 which combines Figs. 2a and 2b. Two rings of identical right-triangle section have the same ring axis  $X-X$ , outer radius  $R$ , and inner radius  $r$ . In both cases leg  $b$  is parallel to the ring axis, but in Fig. 2a it is on the inside, while in Fig. 2b it is on the outside. In Fig. 2b the ring, of centroid radius  $R_o'$ , has a much greater bulk inertia than the ring of Fig. 2a, of centroid radius  $R_o$ . But the applied section inertia  $I_{SA}$  is the same in both cases. If the two rings had the same centroid radius  $R_o$ , their moment of inertia  $I$  also would be the same. Generally speaking, in the case of a ring of a given centroid radius  $R_o$  and of a given sectional area  $A$  and a given section axis  $Z-Z$ , it is immaterial, so far as the moment of inertia is concerned, which portion of  $A$  is on the outside and which portion is on the inside of  $Z-Z$ .

This last statement, however, is based upon our assertion that the third term inertia

$$I_3 = 2\pi \int_i dAx^3$$

can be neglected. While  $I_3$  has no appreciable effect on the result, it is of theoretical interest to know what it means. Only this knowledge will

convince us that  $I_3$  is insignificant. The above integral tells us the following: If the section area  $A$  is revolved about the section axis  $Z-Z$ , two solids of revolution are formed,  $S_o$  by the revolution of the outer portion and  $S_i$  by the revolution of the inner portion. With reference to axis  $Z-Z$ ,  $S_o$  has an inertia  $I_o$  and  $S_i$  an inertia  $I_i$ . Then  $I_3 = I_o - I_i$ . This equation makes it clear why, for sections symmetrical about axis  $Z-Z$ ,  $I_3$  equals zero. It also reveals a relation which is best explained with the help of Fig. 2. It can be shown that for the triangular ring section of Fig. 2a, having leg  $b$  on the inside  $I_3 = 0.02327 bh^4$ . Then, with  $I_3'$ , the third term inertia of the ring section of Fig. 2b, we have

$$I_3' = -I_3 = -0.02327 bh^4.$$

Equal ring sections of any shape, positioned relative to their section axes  $Z-Z$  and  $Z'-Z'$  as shown in Fig. 2, may be termed conjugate ring sections. The third term inertias of two conjugate ring sections, therefore, are equal, but of opposite sign.

This is a very convenient relation for theoretical studies. In the accompanying table of moments of inertia of ring bodies will be found the inertia formula pertaining to both Fig. 2a and to Fig. 2b (using the proper values of  $R_o$  and  $R_o'$ ). If

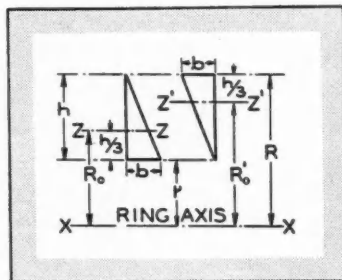


Figure 2

we move the rings of Fig. 2 axially until they touch, they form a ring of rectangular section, whose inertia formula is well known. This furnishes a convenient check for the triangle-ring formula by purely mathematical, not arithmetical, means. In making this check, the third term inertias of the triangles can be completely ignored, as their sum equals zero. In a similar manner the sector-ring formulae of the table were checked mathematically, without consideration of the third

term, by imagining the section of a torus cut into four quadrants, the centerlines of the quadrants being parallel and perpendicular to the ring axis.

The following numerical values are offered to substantiate our claim that the "third-term" inertia can be neglected. More unsymmetrical sections than the triangles of Fig. 2 can hardly be imagined. Thus our example pertains to Fig. 2. Let us make both  $h$  and  $r$  equal to 1 in. and  $b$  equal to  $\frac{1}{2}$  in. That brings the two ring sections closer to the ring axis than they are likely to be in any engineering problem, and this closeness tends to increase the error committed in neglecting  $I_3$ .

With these assumptions and designating the total inertia, including the third term, by  $I_t$ , we have:

For Fig. 2a

$$I = 4.0725 \text{ in.}^5 \quad I_3 = 0.01163 \text{ in.}^5$$

$$I_t = 4.0841 \text{ in.}^5$$

Error = 2.8 per mill

For Fig. 2b.

$$I = 7.7086 \text{ in.}^5$$

$$I_3 = 0.01163 \text{ in.}^5$$

$$I_t = 7.69697 \text{ in.}^5$$

Error = 1.5 per mill

In view of the fact that these are the extreme values of the errors that may occur, our assertion that the "third-term" inertia can be neglected appears to be justified.

I wish to give here also the inertia formulae pertaining to Fig. 2 that are derived by straight integration and thus include  $I_3$ . They are:

For Fig. 2a

$$I = 2\pi \frac{b}{h} \left[ \frac{R}{4} (R^4 - r^4) - \frac{1}{5} (R^5 - r^5) \right]$$

For Fig. 2b

$$I = 2\pi \frac{b}{h} \left[ \frac{1}{5} (R^5 - r^5) - \frac{r}{4} (R^4 - r^4) \right]$$

On inspection of the accompanying table of moments of inertia it will be noticed that two outside axes are assigned to every unsymmetrical section, the "ring axis" and the "alternate ring axis." By this expedient the section may be considered either one of the two conjugate sections.

It will be noticed also that all in-



ertia formulae have a common general structure, viz.:

$$I = V (R_o^2 + n f^2)$$

where  $V$  is the volume of the ring;  $R_o$ , the centroid radius;  $f$ , an outstanding dimension of the section, mostly but not necessarily the height, and  $n$  is a number, either constant or changing with the proportions of the section. How this common structure of the  $I$ -formulae originates is best shown by an example.

Let us take the ring of elliptical section. With the designations of this analysis and of the table we have:

$$A = ab\pi \quad V = 2R_o\pi A$$

$$I_B = VR_o^2 \quad I_S = \frac{\pi a^3 b}{4}$$

$$I_{SA} = 6\pi R_o I_S = 2\pi R_o \times \frac{3}{4}\pi a^3 b \\ = 2\pi R_o \times \pi ab \times \frac{3}{4}a^2 = V \times \frac{3}{4}a^2$$

$$I = I_B + I_{SA} = V(R_o^2 + \frac{3}{4}a^2)$$

It will also be noticed that only approximate  $I$ -formulae are given for the circular-segment section. This is necessitated by the unwieldy length of the true formulae. It is preferable to consider a segment  $A$  to be the difference between the corresponding sector  $A_1$  and the corresponding center triangle  $A_2$ , and thus to determine the inertia of the segment ring of section  $A$  as the difference of the inertias of rings of sections  $A_1$  and  $A_2$ . For shallow circular segments up to a center

angle  $2\alpha = 90$  deg. the approximate equations result in entirely negligible errors.

The equations of the text and the table give the moments of inertia in inch<sup>4</sup>, assuming that the ring dimensions are given in inches. If the moment of inertia is wanted in lb. in.<sup>2</sup>, the results have to be multiplied by the unit weight  $\gamma$  of the material in lb./cu. in. (For cast iron  $\gamma = 0.26$ .) In other words, the volume  $V$  of the  $I$ -formulae has to be replaced by the weight  $W$ . If, however, the moment of inertia is wanted in lb.-in.-sec.<sup>2</sup> (as mostly used in physical analysis), the results given by our equations must be multiplied by  $\gamma/g$ , (where  $g = 386$  in./sec.<sup>2</sup>). For cast iron, therefore, they have to be divided by 1484.

## Early History of the Pneumatic Tire

**I**N our issue of July 16, 1938, we published an item on the "golden anniversary" of the pneumatic tire, the practical development of which dates from 1888, when J. B. Dunlop, a Belfast veterinarian, constructed such tires for the wheels of his son's tricycle and took steps to produce them commercially. Additional light is thrown on the early history of the pneumatic tire by a book by Sir Arthur Du Cros, chairman and general manager of the Dunlop Rubber Co. from 1892 to 1930, which has just been published and of which reviews have appeared in our British contemporaries.

Dunlop disposed of a share of his rights to William Bowden, a Dublin bicycle dealer, and the latter again divided his holdings with J. M. Gillies, also of Dublin, the manager of a newspaper and a friend of the Du Cros family. A company formed to exploit the new product was known as the Pneumatic Tyre Company, and its four directors were R. J. McCreedy, a cycle racer and journalist; F. J. Woods, who later invented a tire valve that was known under his name; J. B. Dunlop, and R. Booth, a bicycle dealer. In 1890 it was learned that Dunlop had no valid basic patent on the tire, as he had been preceded as far back as 1845 by William Thompson, who, in 1871,

had driven Dom Pedro, emperor of Brazil, in a brougham fitted with pneumatic tires.

While it has been stated that Dunlop received very little for his rights, Du Cros states he was paid £500 cash and received 3000 shares of the capital stock of the company—20 per cent of the whole amount. Although he had given one-half of his holdings to Bowden and Gillies, he is said to have admitted at a latter date that he realized approximately £100,000, which is considered no meager award, considering he had no valid patent.

Dunlop did not get along very well with his associates, and resigned from the company in 1895. Later he brought suit against the company as a result of its use of his portrait in its advertising. The advertising agents had taken the bearded head of Dunlop and added the figure of what is described as "a lovable type of sportsman." Dunlop, however, regarded this as a satirical caricature of himself and objected, and when he brought an action the company agreed to discontinue the use of the picture.

It has been pointed out as a strange fact of tire history that Dunlop, who had no valid patent, should be remembered and acclaimed as the father of the pneumatic tire, where-

as others such as Thompson, Welch, Bartlett and Westwood, who either actually pioneered the tire or made substantial contributions to its practical development, are practically unknown to the general public. The probable explanation is that Dunlop not only timed his work excellently, since it fell in the early part of the bicycle era, but he also associated himself with very capable businessmen who put a great deal of energy behind the practical development and the commercialization of the product.

**F**OLLOWING a reduction in the tax on gasoline in Yugoslavia toward the end of 1937, the number of motor vehicles in service in that country increased considerably. During the first half of 1938 there were imported 1799 passenger cars, as compared with 1208 during the same period the previous year, and 644 commercial vehicles, as compared with 266. The value of the automobile imports increased from 47 to 86 million dinars. Imports of petroleum products increased by 39.9 per cent in volume and 30 per cent in value. Home production of petroleum more than doubled during the period.

## What Must Be Done About National Defense—NOW?

(Continued from page 164)

of lead, and to 100 and this without the crippling restriction of limited supply.

One of the foremost difficulties to overcome has been the avoidance of carburetor icing. As the average

drop in temperature due to vaporization of fuel in the carburetor is roughly 60 deg. Fahr., such ice formation is not necessarily confined to winter operations, but may with high relative humidities be encountered with air temperatures as high as 70 deg.

The services in cooperation with the airlines first adopted stop gap measures, employing non-freezing mixtures or applying heat to the carburetor intake air, but they realized that the true solution lay in basic redesign of the carburetor. As a direct result of service encouragement, a carburetor incorporating many of the desired points of redesign was produced commercially under Navy experimental contract. A year's research, improvement and testing, by the Naval Aircraft Factory yielded a design which gave comparative ease of manufacture and assembly, fair metering and calibration characteristics, good operation in all maneuvers, and almost complete freedom from icing difficulties. In a year's service use, it was found that no preheat is necessary in any climatic conditions encountered by naval aircraft. The new carburetor was made available to all domestic operators and now flies many of the airlines.

Because of the peculiarly adverse conditions under which naval aircraft operate, continual effort is being directed to reduce corrosion of metal parts. It has been found from experience that the problem of corrosion must be attacked at its source, mainly by insuring that features which actually accelerate corrosion are not included in the design of the airplane. The bulk of our trouble is caused by lack of free drainage of structures and the indiscriminate use of dissimilar metals in contact. Accordingly, every possible step is being taken in the design of naval aircraft to insure that water or moisture which gains access to the interior of a structure is afforded free drainage so that it may not remain and induce corrosion. Where dissimilar metals must be used because of structural considerations, they are insulated by one means or another from the aluminum alloy parts with which they are in contact.

The search for improved protective coatings has always been assigned high priority by the Bureau of Aeronautics and many developments initiated by the Navy have been passed on to commercial aviation. In particular, the anodic treatment, zinc chromate primer and

**NEVER HAVE TO  
REPLACE THAT SEAL...  
IT'S MADE OF  
NEOPRENE**

*"Yeah...Notice  
how many new cars  
are coming through  
with neoprene parts  
in the tough spots."*

EVERY YEAR, neoprene is helping designers build longer life into more and more auto parts. For neoprene, Du Pont's remarkable chloroprene rubber, has all the best features of natural rubber... plus resistance to oils, gasoline, heat, sunlight, air and ozone.

You'll find neoprene used in water pump seals, oil pump gaskets, hand brake cable bellows, rocker arm grommets, radiator cap gaskets, gas tank filler hose, valve compartment covers... in fact, you'll find neoprene used in more than forty tough spots in 1939 cars... where other materials have failed.

On 1940 cars, leading manufacturers are planning to use even more neoprene. For engineers have discovered that Du Pont neoprene makes better, longer-lasting parts. And better parts make better cars. Doesn't this suggest that neoprene can help you win greater acceptance for your product, too?

**Make that part  
better with  
NEOPRENE**

**CHLOROPRENE RUBBER  
MADE BY DU PONT**

*Consult your  
rubber supplier  
or write us.*



**E. I. DUPONT DE NEMOURS & CO., INC., RUBBER CHEMICALS DIV., WILMINGTON, DEL.**



synthetic lacquers stand out as important contributions of recent years. The aluminum metal spray has been found very effective in preventing corrosion of steel as well as of aluminum alloy parts, and our standard overhaul practice makes use of this means of protecting engine cylinders in all ship-based seaplanes. Alclad aluminum alloys are being used to an increased extent and stainless steels are being considered for possible future construction.

Non-destructive examination of steel and other magnetic parts has long been sought, and a reasonably satisfactory method has been provided by the method known commercially as the magnaflux. Standard overhaul practice makes use of this valuable aid in detecting hidden flaws, and all naval overhaul bases are equipped with this device, the investment having proved a wise one.

Aluminum alloy rivets of A17ST material have been in use for some time by various airlines, and recent service tests demonstrate that they are satisfactory from the viewpoint of corrosion resistance. Their wide future use is indicated by the saving which they make possible in overhaul costs due to the elimination of heat treatment.

Increased reliability of aircraft engines, and reduction of the number of maintenance and overhaul procedures are eagerly sought by military and commercial operators. Notable recent improvements such as automatic valve gear lubrication, nitride hardening of cylinder barrels, steel exhaust valve seats, case-hardening of crank-pins, the development of pre-fitted master rod bearings, improved construction and better finning of engine cylinders are steps in the right direction. We believe, however, that the work done by British Bristol Airplane and Engine Company in the successful development of the sleeve-valve engine warrants the serious effort of American engine manufacturers to develop an engine of this type, with its inherently greater reliability due to the large reduction in parts, and its higher power output made possible by the elimination of a red-hot exhaust valve head from the combustion chamber of the engine.

By far the major maintenance problem, however, I have not as yet touched—and I do not need to stress to you the value of standardization. A permanent working committee of the Joint Aeronautical Board of the

War and Navy Departments has been set up to deal with the standardization of specifications for aeronautical materials and equipment as well as with the adoption of standard design requirements. One of the most active projects before this committee at the present time is the standardization of aircraft engine specifications. Full consideration is being given to the usefulness of these standards to commercial aviation, from which much assistance has already been received. It is considered of utmost importance

that aircraft engine builders agree upon standard size for the infinitude of small parts used in aircraft engines, and assist the operator to reduce overhaul costs by eliminating the needless accumulation of stocks of parts of non-standard size. A commendably noteworthy degree of interchangeability already exists in aircraft engine accessories, such as carburetors, magnetos, fuel and vacuum pumps, and engine starters. Let us continue along this road, rather than leave it for the jungle of diversification.

# FORGINGS

WITH A BACKGROUND —

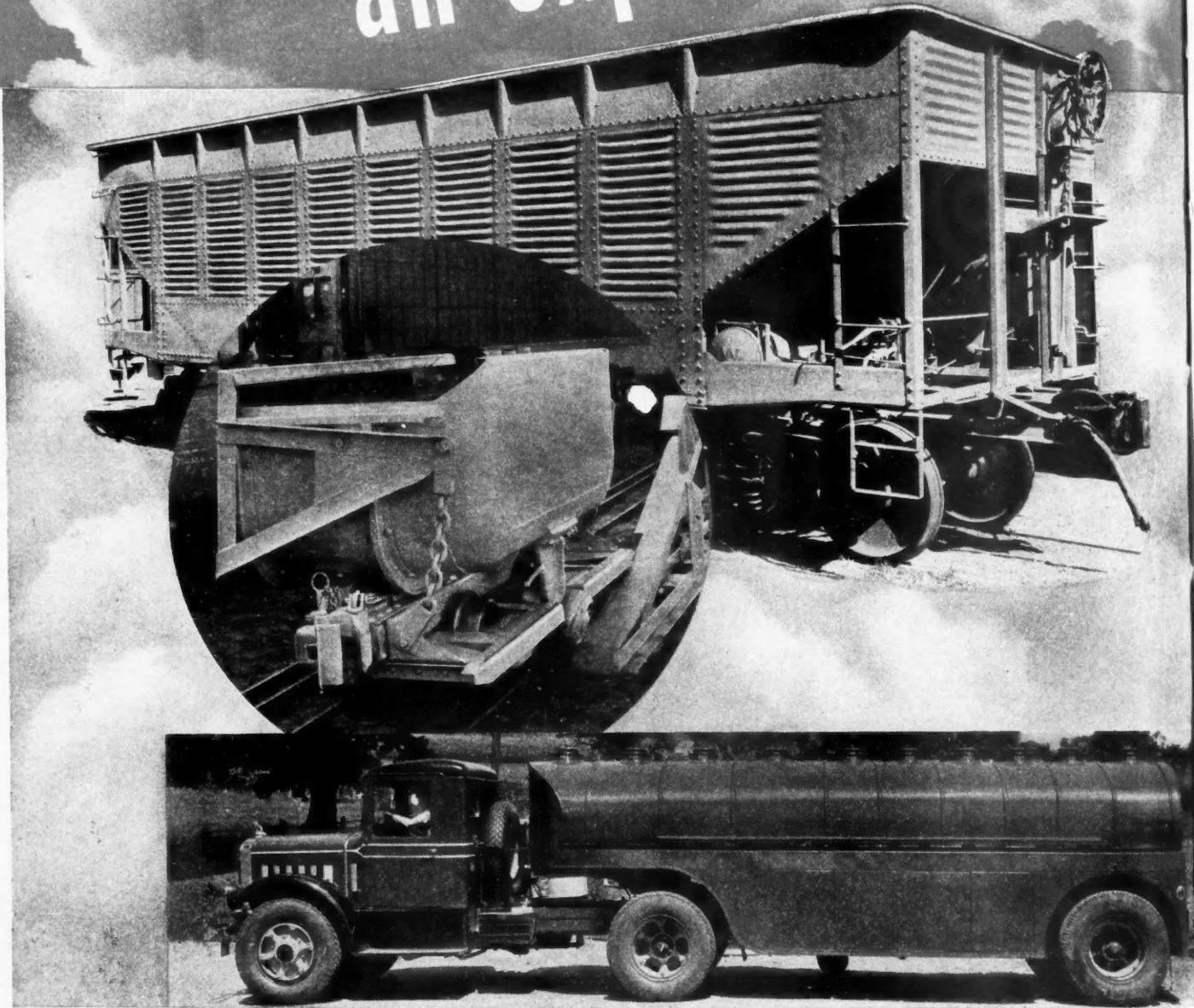


**WYMAN-GORDON FORGINGS**  
are under laboratory control from raw material to finished product. That's why they are always guaranteed forgings.

**WYMAN-GORDON**  
**THE CRANKSHAFT MAKERS**  
WORCESTER, MASS. · HARVEY, ILL. · DETROIT, MICH.



A few years ago  
an experiment...



# REPUBLIC DOUBLE

TWO GRADES IN HOT OR COLD ROLLED SHEETS AND STRIP

February 11, 1939

When writing to advertisers please mention Automotive Industries

Automotive Industries